

**EFFECTIVENESS OF MIRROR THERAPY UPON MOTOR FUNCTION OF  
UPPER EXTREMITY AMONG STROKE PATIENTS**

**By**

**PRADEEPHA. N**

**A DISSERTATION SUBMITTED TO THE TAMILNADU DR.M.G.R MEDICAL  
UNIVERSITY, CHENNAI, IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE DEGREE OF MASTER  
OF SCIENCE IN NURSING**

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UPPER EXTREMITY AMONG STROKE PATIENTS**

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## **DECLARATION**

I hereby declare that the present dissertation entitled "**Effectiveness of Mirror Therapy upon Motor Function of Upper Extremity among Stroke Patients**" is the outcome of the original research work undertaken and carried out by me under the guidance of **Dr.Latha Venkatesan**, M.Sc (N)., M.Phil (N)., Ph.D. (N)., Ph.D. (HDFS)., M.B.A (HM)., Principal, Apollo College of Nursing, and **Dr.Lizy Sonia.A**, M.Sc (N)., Ph.D (N)., Vice Principal, Medical Surgical Nursing department, Apollo College of Nursing, Chennai. I also declare that the material of this has not found in anyway, the basis for the award of any degree or diploma in this university or any other university.

**N.PRADEEPA**

**M.SC (N) II YEAR**

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## **SYNOPSIS**

An Experimental Study to Assess the Effectiveness of Mirror Therapy upon Motor Function of Upper Extremity among Stroke Patients at Selected Hospitals, Chennai.

### **The Objectives of the Study were,**

1. To assess the level of motor function of upper extremity before and after mirror therapy in the control group and the experimental group of stroke patients.
2. To determine the effectiveness of the mirror therapy by comparing the motor function of upper extremity between the control group and the experimental group of stroke patients.
3. To assess the satisfaction regarding mirror therapy in the experimental group of stroke patients.
4. To find out the association between the demographic variables and the motor function of upper extremity among the control group and the experimental group of stroke patients.
5. To find out the association between the clinical variables and the motor function of the upper extremity among the control group and the experimental group of stroke patients.

The conceptual framework of the present study was based on Myra Levine's Energy Conservation Model (1967), which was modified for the present study. The study variables were Mirror Therapy and the Motor Function of the upper extremity among stroke patients.

A quasi experimental study was conducted to achieve the objectives of the study. The present study was conducted at Apollo Hospitals, Chennai. The study subjects were selected using purposive sampling technique. The study included 30 subjects from Apollo Main Hospital and 30 subjects from Apollo Specialty Hospital who satisfied the inclusion criteria.

An extensive review of literature and guidance from experts laid the foundation for the investigator for developing demographic variable proforma, clinical variable proforma in order to obtain the baseline data by interview method. The researcher also used the observation checklist Fugl-Meyer upper extremity motor function assessment tool for stroke patients and rating scale to assess the satisfaction of mirror therapy. The data collection tools were validated and reliability was established. After confirming the feasibility and research ability through pilot study, the data for main study was conducted during a period of six weeks. The collected data was analyzed by using appropriate descriptive and inferential statistics.

### **The Major Findings of the Study were**

- In the age group between 36-50 years, there were 36.66% of stroke patients are equally distributed, most of them were males (70%, 63.33%) and (43.33%, 43.33%) were employed in the control group and the experimental group respectively.
- Findings also revealed that, there was no statistically significant difference between the control group and the experimental group with regard to demographic variables of the patients such as age, gender, occupation and educational status indicating the homogeneity of the groups.

- Most of the stroke patients were diagnosed to have ischemic stroke (63%, 63.33%) with duration of illness 1-4 months (33.33%, 26.66%), smokers (66.66%, 43.33%) and (30%, 43.33%) were alcoholics, (30%, 30%) had comorbid illness in the control group and in the experimental group respectively.
- The motor function of the upper extremity in the control group was not adequate (100%) during the pretest and remained the same (100%) during the posttest also, whereas in the experimental group the motor function was moderately adequate (26.66%) during the posttest when compared to (3.33%) during pretest among stroke patients.
- There was no significant difference between pretest ( $M=16.03$ ,  $SD=3.36$ ) and posttest ( $M=16.8$ ,  $SD=4.18$ ) in motor function of upper extremity among stroke patients in the control group, whereas there was statistically significant difference between pretest ( $M=16.26$ ,  $SD=4.99$ ) and posttest ( $M=19.8$ ,  $SD=5.33$ ) in motor function of upper extremity among stroke patients in the experimental group at  $p<0.01$  level.
- There was no significant difference in the motor function of upper extremity during pretest between the control group and the experimental group of stroke patients, whereas there was statistically significant difference in posttest between the control group ( $M=16.8$ ,  $SD=4.18$ ) and the experimental group ( $M=17.93$ ,  $SD=5.99$ ). The posttest motor function was higher in the experimental group than in the control group, significant at  $p<0.05$  level. Hence the null hypothesis  $H_0$ 1 stating that, there will be no significant difference in the motor function of upper



extremity before and after mirror therapy in the control group and the experimental group of stroke patients was rejected.

- Majority of the stroke patients undergoing mirror therapy in the experimental group were highly satisfied with the demonstration of mirror therapy (93.33%), the effectiveness of therapy (90%) and approach of researcher (93.33%).
- There was no significant association between the demographic variables namely age, gender, occupation, educational status with motor function of upper extremity in stroke patients. Hence the null hypothesis  $H_02$  stating that, there will be no significant association between the demographic variables and motor function of upper extremity before and after mirror therapy in the control group and the experimental group of stroke patients was retained.
- There was no significant association between the clinical variables namely types of stroke, side affected with stroke, duration of illness, co-morbidities, history of smoking, history of alcoholism, and motor function of the upper extremity in stroke patients. Hence the null hypothesis  $H_03$  stating that, there will be no significant association between the clinical variables and motor function of upper extremity before and after mirror therapy in the control group and the experimental group of stroke patients was retained.

## **Recommendations**

- A similar study could be undertaken on larger scale for more valid generalization.
- The present study could be replicated in different settings.
- Similar study can be conducted to improve the lower extremity motor function among stroke patients.
- A study could be conducted to assess the sensory function of stroke patients after mirror therapy.
- Study can be conducted to compare the effectiveness of mirror therapy with other interventions upon upper extremity motor function among stroke patients.
- A study could be conducted to assess the level of knowledge of nurses on mirror therapy.

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# CHAPTER I

## INTRODUCTION

### Background of the study

*“The more you do the better you become”*

*-Dena Tyson*

Stroke is becoming an important cause of premature death and disability in low-income and middle-income countries like India, largely driven by demographic changes and enhanced by the increasing prevalence of the key modifiable risk factors. A majority of stroke survivors continue to live with disabilities, and the costs of on-going rehabilitation and long term care are undertaken by family members, which causes impoverishment.

According to the World Health Organization, 15 million people suffer stroke worldwide each year. Of these, 5 million die and another 5 million are permanently disabled. High blood pressure contributes to more than 12.7 million strokes worldwide. (WHO, 2016).

Stroke is the third leading cause of death in the United States. More than 140,000 people die each year from stroke in the United States. Stroke is the leading cause of serious long-term disability in the United States. Each year, approximately 795,000 people suffer from stroke. About 600,000 of these are first attacks, and 185,000 are recurrent attacks. In developed countries, the incidence of stroke is declining, largely due to efforts to lower blood pressure and reduce smoking. However, the overall rate of stroke remains high due to the aging of the population. (Rogers, 2016).



Europe averages approximately 650,000 stroke deaths each year. There are more than 100,000 strokes in the UK each year; that is around one stroke every five minutes. There are over 1.2 million stroke survivors in the UK. Every two seconds, someone in the world will have a stroke. (Stroke Association, 2016).

In India, from 2003 to 2013, the relative rate of stroke death fell by 33.7% more among those >65 years and the actual number of stroke deaths declined by 18.2%. Yet each year, 795,000 people continue to experience a new or recurrent ischemic or hemorrhagic stroke. (WHO, 2016).

Arm function is ubiquitous in all aspects of a person's life and thus, a loss of arm function can be devastating to stroke patients. The patient's arm affected by hemiplegia is a common problem following a stroke, and it has been estimated that 50-80% of stroke patients experience such a problem. Despite rehabilitation treatments to an affected arm, permanent and persistent disability may result. Care management of a patient with a hemiplegic arm following a stroke is not the prerogative of one specific discipline in one specific specialty. (Wade et al, 2015). There are about 6.2 million non-institutionalized stroke survivors are alive today. (National Center for Health Statistics, 2012).

Mirror therapy is a form of motor imagery in which a mirror is used to convey visual stimuli to the brain through observation of one's unaffected body part as it carries out a set of movements. The underlying principle is that movement of the affected limb can be stimulated via visual cues originating from the opposite side of the body. Hence, it is thought that this form of therapy can prove useful in patients who have lost movement of an arm or leg including those who have had a stroke.

Mirror therapy is a specific therapy designed to strengthen arms and hands weakened by a stroke. In mirror therapy, we use movements of the stronger hand and arm to trick the brain into thinking that the weaker arm is also moving. Researchers have shown that this tricking of the brain actually causes the brain areas responsible for making the weaker arm move become stimulated. (Canadian Heart and Stroke Foundation, 2016).

A motor impairment to an arm following a stroke may be owing to either damage to the motor cortex of the brain or damage to the descending fibers of the corticospinal tract. If this neurological damage is above motor decussation, the signs and symptoms will be seen in the limb on the opposite side of the body. (Kenny, 2002).

### **Need for the study**

Stroke death rates declined more among people aged  $\geq 65$  years from 534.1 to 245.2 per 1,00,000 than among those aged 45 to 64 years from 43.5 to 20.2 per 1,00,000 or those aged 18 to 44 years from 3.7 to 2.0 per 1,00,000. (Mozaffarian, 2016).

Kim (2016) conducted a study on twenty-five stroke patients who were receiving physical therapy and other group received mirror therapy. The therapies were applied for 30 minutes per day, five times per week, for a total of 4 weeks. Upper limb function was measured with the action research arm test, Fugl- Meyer assessment, and the box and block test, and activities of daily living were measured with functional independence measure. The findings of this study demonstrated that mirror therapy is more effective than conventional therapy for the training of stroke patients to improve their upper limb function and activities of daily living.

Cristina (2015) has conducted a study on mirror therapy enhances upper extremity motor recovery in stroke patients. It was randomized controlled trial done for the purpose

of evaluating the effects of mirror therapy program in addition with physical therapy methods on upper limb recovery in patients with sub-acute ischemic stroke. 15 subjects followed a comprehensive rehabilitative treatment, 7 subjects were in control group received only conventional therapy and 8 subjects received mirror therapy for 30 minutes every day, five times a week, for 6 weeks. Results revealed there were improvement in the motor function of upper extremity and moreover mirror therapy is an easy and low-cost method to improve motor recovery of the upper limb.

Mirror therapy has been proposed to improve the motor function of chronic individuals with stroke from mild to moderate impairment with regard to severe upper limb paresis, mirror therapy has shown to provide limited motor improvement in the acute or sub-acute phase. The aim of this study was to determine the effectiveness of mirror therapy on chronic stroke survivors with severe upper-limb impairment in comparison with passive mobilization. Results of this study is in comparison with passive mobilization, mirror therapy in chronic stroke survivors with severely impaired upper-limb function may provide a limited but positive effect on light touch sensitivity while providing similar motor improvement. (Colomer, 2015).

Ezendam (2009) conducted a systematic literature search to identify studies concerning mirror therapy in upper extremity. The included journal articles were reviewed according to a structured diagram and the methodological quality was assessed. Fifteen studies were identified and reviewed. The present review showed a trend that mirror therapy is effective in upper limb treatment of stroke patients.

Langhorne (2009) conducted a systematic review on motor recovery after stroke. In that he explained loss of functional movement is a common consequence of stroke for which a wide range of interventions has been developed. Improvements in recovery of

arm function were seen for constraint-induced movement therapy, electromyographic biofeedback, mental practice with motor imagery, and robotics. Improvements in transfer ability or balance were seen with repetitive task training, biofeedback, and training with a moving platform. Physical fitness training, high-intensity therapy usually physiotherapy, and repetitive task training improved speed.

Buccino (2006) found that Mirror neurons got activated during the execution of hand object-directed actions and during the observation of the same actions performed by other individuals. Researcher reviewed the experimental evidence on the role of the mirror neuron system in action understanding, imitation, complex actions, and internal rehearsal called motor imager of actions. On the basis of features of the mirror neuron system and its role in action understanding and imitation, researcher discussed the possible use of action, observation and imitation as an approach for systematic training in the rehabilitation of patients with motor impairment of the upper limb after stroke.

Stevens (2003) conducted a study to examine the effectiveness of using motor imagery training in the rehabilitation of hemiparesis. A motor imagery training program consisting of imagined wrist movements like extension, pronation-supination and mental simulations of reaching and object manipulation making use of a mirror box apparatus. The main outcome of this study was grip strength, 4 wrist functionality measurements, and 3 timed performance tests.

Performance of the paretic limb improved after the imagery intervention, indicated by increases in assessment scores followed by functionality and decrease in movement times. The improvements over baseline performance remained stable over a 3-month period.

During the clinical experience, the researcher had come across several stroke patients having upper extremities disability after stroke. Regulated upper extremity motor function is essential for day to day activities for every stroke patient. Hence the researcher envisioned that providing mirror therapy improves the motor function of upper extremity among stroke patients. This therapy can be used in home care setting, rehabilitation center and also in hospital settings. Hence the investigator has undertaken this study to assess the effectiveness of mirror therapy upon motor function of upper extremity among the stroke patients.

### **Statement of the problem**

An Experimental Study to Assess the Effectiveness of Mirror Therapy upon Motor Function of Upper Extremity among the Stroke Patients at Selected Hospitals, Chennai.

### **Objectives of the Study**

1. To assess the level of motor function of upper extremity before and after mirror therapy in the control group and the experimental group of stroke patients.
2. To determine the effectiveness of the mirror therapy by comparing the motor function of upper extremity between the control group and the experimental group of stroke patients.
3. To assess the satisfaction regarding mirror therapy in the experimental group of stroke patients.
4. To find out the association between the demographic variables and the motor function of upper extremity among the control group and the experimental group of stroke patients.

5. To find out the association between the clinical variables and the motor function of the upper extremity among the control group and the experimental group of stroke patients.

### **Conceptual and Operational Definitions**

#### **Effectiveness**

##### Conceptual definition

It refers to the capability of producing a desired result when something is deemed effective. (Oxford dictionary)

##### Operational definition

In this study it refers to improvement of motor function in upper extremity after administration of mirror therapy among stroke patients, as measured by Fugl-Meyer motor function assessment tool.

#### **Mirror therapy**

##### Conceptual definition

Mirror therapy is a form of motor imagery in which a mirror is used to convey visual stimuli to the brain through observation of one's unaffected body part as it carries out a set of movements. (Heart and Stroke Foundation, 2016).

##### Operational definition

In this study mirror therapy refers to using mirror to create the reflective illusion, while doing movements in the unaffected limb of stroke patients for a period of five times in a week with the duration of 20-30 minutes totally for three weeks.

## **Motor function**

### Conceptual definition

Motor function is a skill which involves the precise movement of muscles with the intent to perform a specific act. (Educlaim).

### Operational definition

In this study it refers to movements and actions of muscles of the upper extremity among stroke patients as measured by Fugl-Meyer motor function assessment tool.

## **Upper extremity**

### Conceptual definition

The upper extremity is the region in a person extending from the deltoid region to the hand, including the arm, axilla and shoulder. (Wikipedia).

### Operational definition

In this study it refers to the affected right or left upper limb from the deltoid region to the hand, including the arm, axilla and shoulder with the loss of motor functions occurred after stroke.

## **Stroke**

### Conceptual definition

Stroke occurs when a blood vessel that carries oxygen and nutrients to the brain is either blocked by a clot or bursts causes damage to the brain. (American Stroke Association, 2017)

### Operational definition

In this study it refers to sudden loss of blood supply to the part of brain resulting in loss of motor and sensory function and diagnosed as stroke by neurologists.

### **Assumptions**

The study assumes that

- Stroke patients cannot perform routine work due to stroke disability.
- Upper extremity complications are common following stroke and may be seriously debilitating to the patients.
- Mirror therapy will help to improve the motor functions of upper extremity among stroke patients.

### **Null Hypothesis**

- Ho1:** There will be no significant difference in the motor function of upper extremity between the control group and the experimental group of stroke patients.
- Ho2:** There will be no significant association between demographic variables and motor function of upper extremity among the control group and the experimental group of stroke patients.
- Ho3:** There will be no significant association between clinical variables and motor function of upper extremity among the control group and the experimental group of stroke patients.

### **Delimitations**

- The study was limited to stroke patients who are having hemiplegia of upper extremity
- The data collection period was limited to 6 weeks duration.

### **Conceptual Framework for the Study**

The conceptual framework deals with the interrelated concepts that are assembled together in some rational theme by virtue of their relevance to common theme (Polit and Beck 2016).



The conceptual framework of present study was based on Myra Levine's energy conservation model. This model focus in promoting adaptation and maintaining wholeness using the principles of conservation. The model guides the nurse to focus on the influences and responses at the organismic level. The nurse accomplishes the goals of the model through the conservation of energy, structure, personal and social integrity. (Levine, 1967).

### **Key concepts of Conservational Principles**

Myra Levine described the four Conservation Principles. These principles focus on conserving an individual's wholeness.

#### **I . Conservation of Energy:**

Refers to promote the movement through mirror therapy to stroke patients in order to improve their mobility for performance of their ADL and self-care within patient ability. Stroke patient's experiences mobility to their upper extremity. A moderate intensity movement helps to restore the energy level.

#### **II. Conservation of Structural Integrity:**

Refers to maintaining or restoring the structure of body preventing physical breakdown and promoting healing. In this study, stroke patients were assisted to strengthen the unaffected upper extremity, promote mobility of the affected extremity, performance of ADL and self-care to promote wholistic extremity functions promoting mobility and assisting adaptation to decreased mobility.

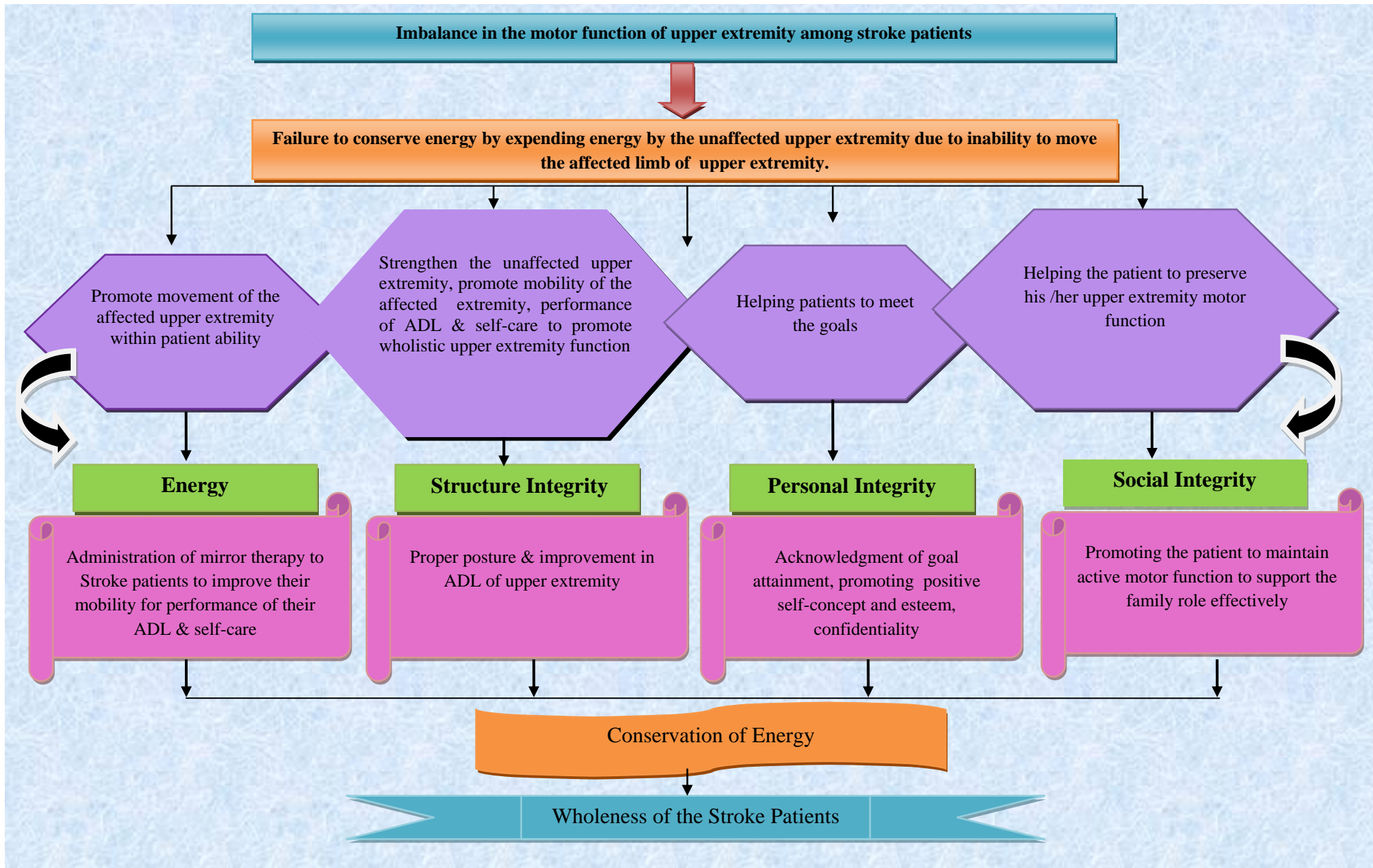
#### **III. Conservation of Personal Integrity:**

Recognizes the individual as one who strives for recognition, respect, self awareness, selfhood and self-determination. Acknowledgement of goal attainment,

promoting positive self-concept and self-esteem, confidentiality. Patients were helped to accomplish the goals.

#### **IV. Conservation of Social Integrity:**

An individual is recognized as someone who resides with in a family, a community, a religious group, an ethnic group, a political system and a nation. Stroke patients were helped to preserve their upper extremity motor function through the active motor function to support family role effectively.



**Figure 1: Conceptual framework based on Myra Levine's Energy Conversation Model (1967)**

### **Projected outcome**

This study will be helpful in obtaining evidence for the nurse in clinical practice. In turn, this will be helpful in improving the motor function of upper extremity among stroke patients and thereby empowering the nurses to gain efficiency with the treatment protocol.

### **Summary**

This chapter has dealt with the background, need for the study and statement of the problem, objectives, conceptual and operational definitions, assumptions, null hypotheses, delimitations and conceptual framework.

### **Organization of Report**

Further aspects of the study are presented in following five chapters.

**CHAPTER – II :** Review of literature

**CHAPTER – III :** Research methodology includes research approach, research design, setting, Populations, sample and sampling techniques, tool description, content validity and reliability of tools, pilot study, data collection procedure and plan for data analysis.

**CHAPTER – IV :** Analysis and interpretation of data.

**CHAPTER – V :** Discussion

**CHAPTER- VI :** Summary, conclusion, implications, recommendations and Limitations.

## **CHAPTER II**

### **REVIEW OF LITERATURE**

A literature review is an organized written presentation of what has been published on a topic by scholars (Burns & Groove, 2014).

The task of literature review involves the identification, selection, critical analysis and reporting of existing information on the topic of interest. A review acquaints the researcher with what has been done in the field and minimizes possibilities of unintentional duplication. It justifies the need for replication, provides the basis for future investigations and helps to relate the findings of one study to another.

This chapter deals with a review of published and unpublished research studies and material related to the present study. The review helped the investigator to develop an insight into the problem area and in building the foundations for the study.

The review of literature for this study was presented under the following headings.

- **Stroke and its Complications**
- **Mirror Therapy among Stroke Patients**

#### **Stroke and its Complications**

Yang (2017) conducted a study on effects of two-handed task training on upper limb function of chronic hemiplegic patients after the development of the motor function of the cerebral cortex is asymmetrical to the dominant hand. Based on such asymmetrical development of the cerebral cortex, when the left hand is

performing a task, the cerebral cortex motor area of the right cerebral hemisphere activates. Thus, the left hemisphere, which is the dominant cerebral hemisphere due to the lateralization of the cerebral hemisphere, is more closely related with motor planning in ADL performance and the same relationships were shown after cerebral hemisphere injury due to stroke.

Human manipulatory skills require some of the most complex levels of brain function and interactions, subtended by central representations that include widely distributed neural networks across cortical and sub cortical structures. Consequently, dexterous behaviours used during daily routine and vocation are often impaired to varying degrees in patients with brain damage.

A major goal of rehabilitation research is to determine how neurological problems in specific patient groups affect normal mechanisms. Stroke rehabilitation is a combined and coordinated use of medical, social, educational, and vocational measures to retrain a person who has suffered a stroke to maximal physical, psychological, social, and vocational potential, consistent with physiologic and environmental limitations. ( Bonita, 2017)

Kim (2016) stated that stroke is a disease of the central nervous system caused by partial loss of brain function which can lead to motor disorders, perception disorders, language disorders, sensory disturbances, etc., and two out of three patients experience damage to motor function in the upper limbs. Furthermore, stroke can bring about limitations in activities of daily living, such as eating and dressing/undressing also, disability in bodily functions develops in about 66% of patients and in activities of daily living in about 75% of patients.

Therefore, the upper limb function of stroke patients is an important factor in daily living that needs to be emphasized in the rehabilitation field.

Upper limb weakness following a stroke affects patients' abilities to undertake activities of daily living and has a negative impact on rehabilitation treatment. Nurses have a role in providing therapy to patients and will need to apply expert clinical judgement and reasoning to assess and identify the effects of individual treatment techniques for patients with upper limb weakness. (Pollock, 2014).

India, like other developing countries, is in the midst of a stroke epidemic. There is a huge burden of stroke with significant regional variations. Stroke units, thrombolysis, and rehabilitation are predominantly available in urban areas, particularly in private sector hospitals. The government is focusing on early diagnosis, management, infrastructure, public awareness, and capacity building at different levels of health care for all the non-communicable diseases including stroke, an organized effort from both the government and the private sector is needed to tackle the rising stroke burden in India. (Pandian, 2013).

Ward (2012) found that spasticity occurs after stroke and gives rise to substantial burden for patients and caregivers. Despite its study over many years, its definition continues to undergo reconsideration and revision. It is clear that an acquired brain injury, including stroke, results in an imbalance of inhibitory and excitatory impulses that leads to upper motor neuron symptoms and that the location and extent of the lesions result in differing symptoms and degrees of spastic severity.

The onset of spasticity has huge variations and may occur shortly or more than one year after stroke. The current understanding of spasticity onset is complicated by the role of contractures, which have been assumed to arise out of spasticity but may have a role in its cause. Other possibly predictive factors for the risk of post-stroke spasticity have been identified, including early arm and leg weakness, left-sided weakness, early reduction in activities of daily living and a history of smoking.

Although capitalizing on existing therapies is well justified, flexibility has to be built into the system to facilitate the successful application of new diagnostic and therapeutic approaches. It should be possible to introduce new tools and technologies, revise protocols, and modify the composition of the stroke care team to fit the requirement of new developments in the field. By doing so, the stroke care system will remain flexible and will be amenable to incorporate advances that will continue to improve the care for the patient with stroke. (Hachinski, 2010).

Hemiplegia is paralysis of one side of the body. Hemiplegia results from damage to the motor area of the cortex or the pyramidal tract fibers. Haemorrhage or clot in the brain's right side causes left-sided hemiplegia, and vice versa. This is because nerve fibers cross over in the pyramidal tract as they pass from the brain and spinal cord. Other cortical areas may be affected producing localized symptoms when voluntary muscle control is destroyed, strong flexor muscles overbalance the extensors. This can cause serious deformities (Polaski, 2010).

Risk factors or risk markers for a first stroke are classified according to their potential for modification as nonmodifiable, modifiable, or potentially modifiable and strength of evidence. Non modifiable risk factors include age, sex,



low birth weight, race/ethnicity and genetic factors. Well-documented and modifiable risk factors include hypertension, exposure to cigarette smoke, diabetes, atrial fibrillation and certain other cardiac conditions, dyslipidaemia, carotid artery stenosis, sickle cell disease, postmenopausal hormone therapy, poor diet, physical inactivity, and obesity and body fat distribution. Less well-documented or potentially modifiable risk factors include the metabolic syndrome, alcohol abuse, drug abuse, oral contraceptive use, migraine headache, hypercoagulability, inflammation, and infection. (Goldstein, 2006).

### **Mirror Therapy among Stroke Patients**

Gurbuz (2016) conducted a study on the use of mirror therapy in motor function recovery of the upper extremity in stroke patients. The patients in both groups underwent conventional therapy for 4 weeks of 60 minutes/day for 5 days in a week among the stroke patients. The patients were evaluated at the beginning and end of the treatment by using the Brunnstrom stage, Fugl-Meyer Assessment upper extremity score, and the Functional Independence Measure self-care score. There was an improvement in Brunnstrom stage and the FIM self-care score in both groups, but the post-treatment FMA score was significantly higher in the mirror therapy group than in the conventional treatment group. Mirror therapy in addition to a conventional rehabilitation program was found to provide additional benefit in motor recovery of the upper extremity in stroke patients.

Rodriguez (2016) conducted randomised control trials in that researcher found that mirror therapy is a relatively new intervention, every time more used and with easy access for the rehabilitation treatment of stroke patient. The patient moves the unaffected limb in front of a mirror watching the reflection of that

move as if he was moving the affected limb. A combination of mirror therapy with conventional rehabilitation obtained significant improvements mainly in motor function but not that much on sensory function and functional performance. About the effect of mirror therapy on hemi neglect, there are significant improvements.

A paretic upper extremity is a common consequence of a stroke. Upper extremity function is essential in most activities of daily living and therefore upper extremity motor recovery can help maintain independence and improve the quality of life for stroke victims. There are several evidence-based treatments for post stroke upper extremity recovery. Most treatments for improving the paretic upper limb are labour intensive and need one-on-one interaction with a therapist for several weeks. But mirror therapy is a simple, inexpensive, and patient-directed treatment that may provide better upper extremity capacity. (Park, 2015).

Harmsen (2015) Mirror therapy is a priming technique to improve motor function of the affected arm after stroke. Objectives of this study was to investigate whether a mirror therapy based action observation protocol contributes to motor learning of the affected arm after stroke. In this totally 37 participants in the chronic stage after stroke were randomly allocated to the action observation or control observation group. The experimental condition effect was investigated by evaluating the primary outcome measure: movement time (in seconds) of the reaching movement, measured by accelerometry. (Mean Difference = 0.14 s; 95% confidence interval = 0.02, 0.26;  $p=0.026$ ). This study showed that a mirror therapy based action observation protocol contributes to motor learning after stroke.

Lim, (2015) conducted study where the subjects were randomly divided into two groups. The mirror therapy group underwent a mirror therapy program together with conventional therapy for 20 minutes per day on 5 days per week for 4 weeks. The control group received a sham conventional therapy program under the same schedule as the mirror therapy group. The Fugl-Meyer Motor Function Assessment (FMA), Brunnstrom motor recovery stage, and Modified Barthel Index (MBI) were evaluated. In this study, they found that the mirror therapy containing functional task was effective in terms of improving the upper extremity functions and activities of daily living in patients with sub-acute stroke.

A randomized controlled trial which was conducted by Pandian (2014) Forty-eight patients were randomized to mirror therapy (n=27) or the control group (n=21). Improvement in the scores on the star cancellation test over 6 months was greater in the mirror therapy. Similarly, improvement in the mirror therapy group was observed in the scores on the picture identification task  $p < 0.001$  and line bisection test ( $p=0.006$ ). In patients with stroke, mirror therapy is a simple treatment that improves unilateral neglect. This study provides Class I evidence that for patients with neglect from thalamic and parietal lobe strokes, mirror therapy improves neglect.

Thieme (2013) conducted a systematic review that summarizes the effectiveness of mirror therapy for improving motor function, activities of daily living, pain, and visuospatial neglect in patients after stroke. Researcher included 14 studies with a total of 567 participants, and compared mirror therapy with other interventions.

When compared with all other interventions, mirror therapy was found to have a significant effect on motor function ( $p < 0.001$ ). Additionally, mirror therapy was found to improve activities of daily living ( $p = 0.02$ ). Researcher found a significant positive effect on pain ( $p = 0.03$ ), which is influenced by patient population. The effects on motor function were stable at follow-up assessment after 6 months.

Radajewska (2013) conducted a study to evaluate the effect of mirror therapy on arm and hand function in sub-acute stroke patients. The study included 60 hemi paretic right-handed patients after ischemic stroke 8-10 weeks after onset. However, there was a significant improvement in self-care of activities of daily living in the right arm paresis subgroup in the mirror group measured using the Functional Index Repty. Mirror therapy improves self-care of activities of daily living for patients with right arm paresis after stroke.

Carvalho (2013) found in her research that mirror neurons are involved in imitative learning through interactions with neural motor areas in humans. The application of mirror therapy techniques, based on the functions of the mirror neuron system, in post-stroke patients has demonstrated good results, mainly when combined with other therapies. Moreover, the studies showed that the mirror neuron system interacts with vision, proprioception and motor commands, promoting the recruitment of mirror neurons and the cortical reorganization and functional recovery of post-stroke patients.

Invernizzi (2013) conducted a randomized controlled trial on the value of adding mirror therapy for upper limb motor recovery of sub-acute stroke patients in that they found mirror therapy is a promising and easy method to improve

motor recovery of the upper limb in sub-acute stroke patients. While mirror therapy use has been advocated for acute patients with no or negligible motor function, it can be usefully extended to patients who show partial motor recovery. The easiness of implementation, the low cost and the acceptability makes this therapy a useful tool in stroke rehabilitation.

Lee (2012) confirms that mirror therapy program is an effective intervention for upper-limb motor recovery and motor function improvement in acute stroke patients. The purpose of this study was to evaluate the effects of the mirror therapy program on upper-limb motor recovery and motor function in patients with acute stroke. Twenty-six patients who had an acute stroke within 6 months of study commencement were assigned to the experimental group ( $n = 13$ ) or the control group ( $n = 13$ ). Both experimental and control group members participated in a standard rehabilitation program, but only the experimental group members additionally participated in mirror therapy program. In upper-limb motor recovery, the scores of Fugl-Meyer Assessment by (shoulder/elbow/forearm items, 9.54 vs. 4.61; wrist items, 2.76 vs. 1.07 hand items, 4.43 vs. 1.46, respectively) were improved more in the experimental group than in the control group ( $p < 0.05$ ).

Mirror training, remodels the motor system by functionally connecting hand movements to the ipsilateral primary sensorimotor cortex. On a system level, it leads to interference of the neural circuit related to motor programming and observation of the trained hand with the illusionary movement of the untrained hand. The hand performance test of the trained right hand did not differ between

the two groups. The untrained left hand improved significantly more in the mirror training group compared with the control group. Hamzei (2012)

Rothgangel (2011) conducted a systematic review of studies regarding the use of mirror therapy interventions among adult patients with stroke. Mirror therapy was defined as the use of a parasagittal mirror or modified mirror device to superimpose movements of the unaffected limb on the affected limb. Studies were required to include outcome measures of activity level in patients with stroke. All 6 RCTs used a parasagittal mirror and the intervention was typically used in conjunction with conventional therapy. Review of the literature revealed moderate evidence to indicate that mirror therapy as an additional intervention improves recovery of arm function, after stroke.

Michielsen (2010) conducted a phase II randomized controlled trial. In this study he found the effectiveness for mirror therapy in chronic stroke patients and is the first to associate mirror therapy with cortical reorganization. The mirror therapy group performed bimanual exercises while watching the unaffected hand in a mirror, during physiotherapy sessions. The control group performed bimanual exercises at the same frequency and duration, with sight of both hands. Future research has to determine the optimum practice intensity and duration for improvements to persist and generalize to other functional domains.

According to Dohle (2009) Rehabilitation of the severely affected paretic arm after stroke represents a major challenge for the researcher who is interested in evaluating the effect of a mirror therapy to simulate the affected upper extremity with the unaffected upper extremity early after stroke. 36 patients with severe hemiparesis with random assignment to either mirror therapy or an

equivalent control therapy. Outcome measures were the Fugl-Meyer sub scores for the upper. In the subgroup of 25 patients with distalplegia at the beginning of the therapy, mirror therapy patients regained more distal function than Control group patients. Mirror therapy improved recovery of surface sensibility. Neither of these effects depended on the side of the lesioned hemisphere. Mirror therapy stimulated recovery from hemi neglect.

Yavuzer (2008) conducted a randomized controlled trial to evaluate the effects of mirror therapy on upper-extremity motor recovery, spasticity, and hand-related functioning of inpatients with sub-acute stroke. In this study total of 40 inpatients with stroke, all within 12 months poststroke. The scores of the Brunnstrom stages for the hand and upper extremity and the FIM self-care score improved more in the mirror group than in the control group after 4 weeks of treatment (by 0.83, 0.89, and 4.10, respectively; all  $p < 0.01$ ) sub-acute stroke patients, hand functioning improved more after mirror therapy in addition to a conventional rehabilitation program compared with a control treatment immediately after 4 weeks of treatment and at the 6-month follow-up, whereas mirror therapy did not affect spasticity.

## **Summary**

This chapter has dealt with the review of literature related to the problem stated. It has helped the researcher to understand the impact of the problem under study. It has been enabled the investigator to design the study, develop the tool, plan the data collection procedure and to analyse the data. Totally 25 review added in this study in this 22 was referred from primary sources and remaining 3 referred from secondary sources.

## **CHAPTER-III**

### **RESEARCH METHODOLOGY**

The methodology of research study is defined as the way the information from participants is gathered in order to answer the research questions or analyze the research problem.

This chapter provides a brief description of the different steps undertaken by the researcher for the study. It involves research approach, research design, setting, population, sample and sampling technique, sampling criteria, selection and development of the instruments, validity and reliability of instruments, pilot study, data collection procedure and plan for data analysis.

The present study was conducted to assess the effectiveness of mirror therapy upon motor function of upper extremity.

#### **Research Approach**

Research approach is the most significant part of any research. The appropriate choice of research approach depends on the purpose of research study which is undertaken.

A quasi experimental research design was chosen for the study to assess the effectiveness of mirror therapy upon motor function of upper extremity among stroke patients.



## Research Design

According to Polit and Beck (2016), a research design is the overall plan for addressing research questions, including specifications for enhancing the integrity of the study.

Quasi experimental design pre-test and post-test research design was used in this study.

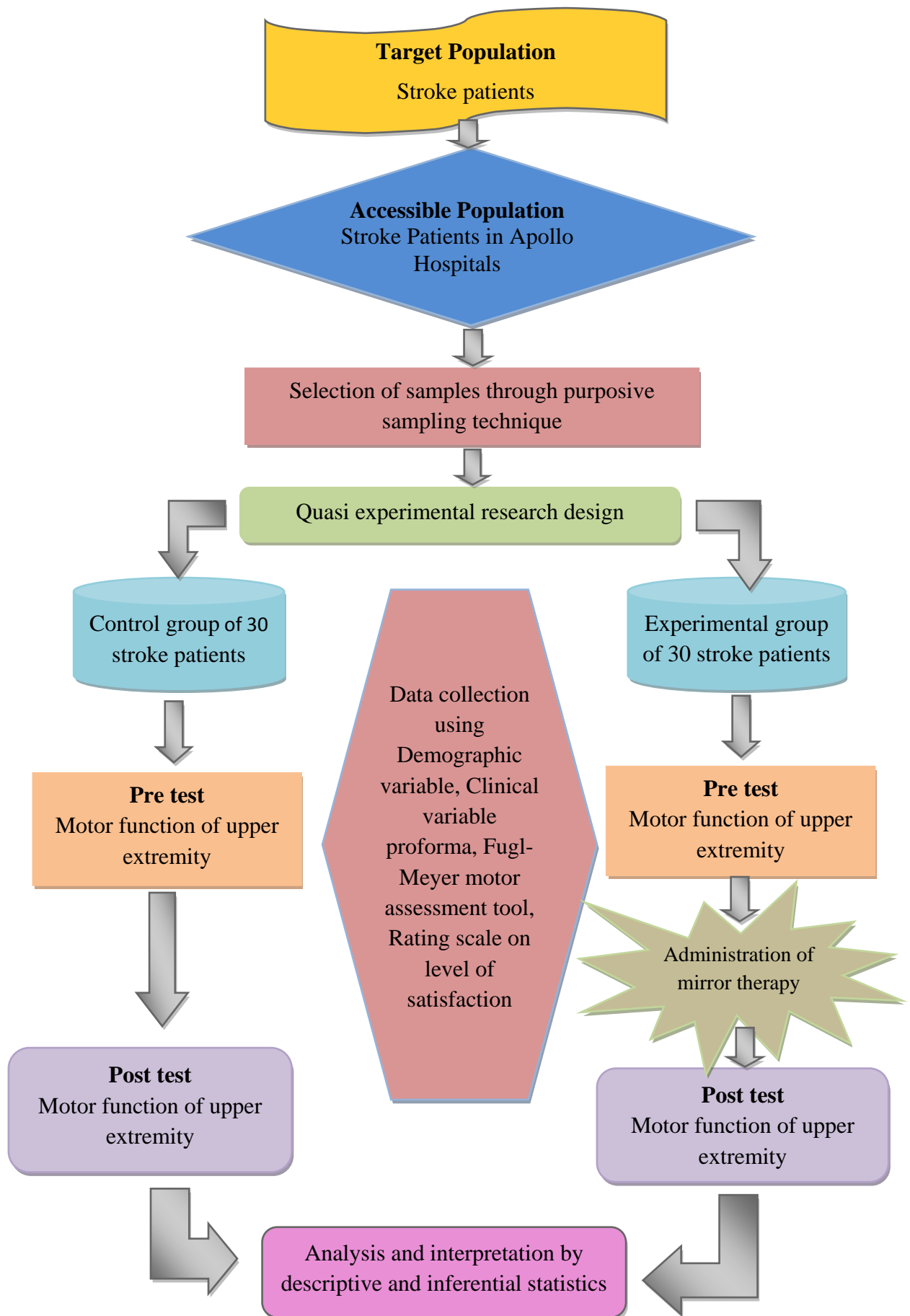
O1      O2

O1   X   O2

O1-Pre-test in the experimental group and the control group.

X- Administration of mirror therapy to the unaffected side of the upper extremity.

O2-Post-test in the experimental group and the control group.



**Figure: 2 Schematic Representation of Research Design**

## **Intervention Protocol**

In mirror therapy, a mirror is placed in the client's sagittal plane so the client cannot see the affected upper limb. The client watches in the mirror the movements made with the healthy limb and simultaneously tries to move the affected limb on the other side of the mirror. To explain why the reflection of the healthy limb in the mirror helps with the motor recovery of the affected limb, the current hypothesis is that the mirror neurons in the brain are activated during the imitation movements and interact simultaneously with the motor neurons. Hence the affected limb hasten speedy recovery. The duration of mirror therapy is for 20-30 minutes for 5 days per week totally for a period of 3 weeks for each sample.

The movements in front of the mirror must be done simultaneously on the affected and the non-affected side. This encourages bilateral use of the upper limbs. If the mirror therapy involves use of an object by the healthy upper limb, the affected upper limb must try to reproduce the movement as accurately as possible but without the object.

## **Movements**

- Flexion and extension of the shoulder, elbow, wrist and fingers.
- Abduction and adduction of the shoulder and fingers
- Internal and external rotation of the shoulder
- Pronation and supination of the forearm
- Ulnar and radial deviation of the wrist
- Circumduction of the wrist

## **Actions**

- Squeeze and release the fist
- Open and close the hand
- Tap the fingers on the table
- Oppose (touch) each finger to the thumb, one by one
- With the hand closed, try to lift each finger, including the thumb

## **Tasks**

- Connect the dots

## **Variables**

An abstract concept when defined in terms that can be measured is called a variable

### **Independent Variable**

The variable that is believed to cause or influence the dependent variable is called as independent variable (Polit and Beck, 2016)

In this study, Mirror therapy was independent variable.

### **Dependent Variables**

The variable hypothesized to depend on or be caused by another variable is the dependent variable. (Polit and Beck, 2016)

In this study dependent variable was motor function of upper extremity.

### **Attribute Variables**

Variables that describe the study sample characteristics are termed as attribute variables. (Polit and Beck, 2016)

In this study, the attribute variables are all demographic characteristics of patients who are suffering from having stroke.

### **Research Setting**

Setting is the physical location and condition in which data collection takes place in a study. (Polit and Beck 2016).

The present study was conducted at Apollo Main Hospitals, and Apollo Specialty Hospitals, Vanagaram in Chennai. These settings were selected on the basis of the feasibility and cooperation of concerned authorities to conduct the study. Apollo Main Hospital is Joint Commission Accredited and it is a part of Asian's foremost integrated healthcare group. Apollo centre for excellence is powered by a relentless pursuit of perfection in Neurosciences and Cardiac specialty. The Apollo Neuro Intensive Care Unit is a 25 bedded NICU which exclusively treats neuro medical and neurosurgical patients.

Apollo Specialty Hospital, Vanagaram is a super specialty hospital with 350 beds including all specialties. This hospital follows the conventional therapy for treating stroke patients more compared to mirror therapy by actively managing the patients after stroke and thereby simultaneously treating the underlying pathology. The researcher collected data from the patient records and from the relatives of the patients who were admitted in the stroke ward and physiotherapy department. The setting was chosen considering the feasibility in terms of availability of adequate subjects and cooperation from the management.

## **Population**

Population is the entire aggregation of cases which meet the designed set of criteria (Polit and Beck, 2016).

### **Target Population**

The target population is the group of population that the researcher aims to study and to whom the study findings will be generalized.

In this study, the target population comprises of all patients who are having upper extremity hemiplegia after stroke.

### **Accessible Population**

The accessible population is the list of population that the researcher finds in the study area.

In this study the accessible population comprises of patients who are having upper extremity hemiplegia in Apollo main hospital and Apollo Specialty Hospitals, Vanagaram, Chennai.

## **Sample**

The Sample is the subset of the population, selected to participate in the study (Polit and Beck, 2016).

The sample in this study consisted of hemiplegic patients admitted in wards and out patients attending physiotherapy at Apollo Main Hospitals, Greaves Road and Apollo Speciality Hospitals Vanagaram, Chennai.

## **Sample Size**

The sample size of this study consisted of 60 patients, in that 30 were in experimental group and 30 in the control group. The sample size is decided based on the feasibility and availability of the sample.

## **Sampling Technique**

Sampling is the process of selecting a portion of the population to represent the entire population (Polit and Beck, 2016).

Purposive sampling technique was adopted for this study. Purposive sampling is also known as judgmental sampling in which the researcher chooses the sample based on who they think would be appropriate for the study.

In this study the researcher selected the patients admitted in wards and the patients coming for physiotherapy who met the inclusion criteria at Apollo Specialty Hospital and Apollo Main Hospital.

## **Sampling Criteria**

### **Inclusion Criteria**

The study included,

- Patients who were diagnosed to have stroke.
- Patients with upper extremity hemiplegia with stroke.
- Adult male and female patients.
- Patients who are willing to participate in the study.

## **Exclusion Criteria**

The study excluded,

- Patients who are very sick and unable to co-operate
- Patients with altered consciousness.
- Patients who underwent any surgery with in last 2 months
- Patients with sensory perceptual alterations.
- Terminally ill patients.

## **Selection and Development of Study Instruments**

- Demographic variable proforma
- Clinical variable proforma
- Fugl-Meyer motor function assessment tool
- Tool to assess the satisfaction of mirror therapy among stroke patients.

## **Demographic Variable Proforma**

This proforma was used by the researcher for collecting demographic variables such as age, gender, occupation, educational status.

## **Clinical Variable Proforma**

In this study, Clinical variables includes, types of stroke, side affected with stroke, habits of smoking, alcohol and history of co-morbid illness.

## **Fugl-Meyer Motor Function Assessment Tool**

Fugl-Meyer motor assessment tool is a standardised tool. Totally 124 items, standardized tool of upper and lower extremities. Researcher used part of this tool 33 items to assess motor function of upper extremity as suggested by the author. This tool consisted of three responses such as none, partly performed and



fully performed with scores ranging from 2 to 0, except item number 1 and 2. Hence the total obtainable score was 0-66. Item number 1 & 2 had 2 responses such as elicited and not elicited with scoring 0 and 2 respectively.

Obtained score is converted into percentage and interpreted as follows

#### **Score Interpretation**

<b>Score</b>	<b>Percentage</b>	<b>Level of motor function</b>
0-22	33	Not adequate
23-44	31	Partly adequate
45-66	36	Adequate

- 0=Not Adequate
- 1=Partly Adequate
- 2=Adequate

Scoring was done based on the assessment of subparts in the tool.

### **Psychometric Properties of the Instruments**

#### **Validity**

Content validity is the degree to which an instrument measures what it is supposed to measure. Content validity is the sampling adequacy of the content being measured. (Polit and Beck 2016).

Content validity refers to the adequacy of the sampling of the domain being studied. The content validity of the tool was obtained by getting opinion from experts in the field of Medicine and Nursing, who suggested some specific modifications in the objectives, hypotheses, Clinical proforma, Checklist for

assessing effectiveness of mirror therapy. These modifications and suggestions of experts were incorporated in the final preparation of the tool.

### **Reliability**

Reliability is the degree of consistency with which an instrument measures the attribute it intended to measure (Polit and Beck, 2016).

The reliability of the tools was determined by using the inter rater technique. Karl Pearson's 'r' was computed for finding out the inter rater reliability. For upper extremity motor function ( $r= 0.99$ )

### **Pilot Study**

According to Polit and Beck, (2016), a pilot study is a miniature of some part of the actual study, in which the instruments are administered to the subjects drawn from the population. It is a small scale version or trial run done in preparation for the major study. The purpose was to find out the feasibility and practicability of the study design and pretesting of tools.

The pilot study was conducted among 10 subjects in Apollo main hospitals, Chennai from 4<sup>th</sup> September to 10 September 2016. Patients who received mirror therapy were included in experimental group and 5 patients in the control group did not receive intervention, the samples were selected by purposive sampling technique, and another 5 were not received mirror therapy. They were selected by purposive sampling as study participants. The data was collected using demographic variable proforma and clinical variable proforma for all patients. The observation of motor function of upper extremity was assessed by standardized Fugl-Meyer sensorimotor assessment tool before and after therapy. After the pilot

study, the study was found to be feasible and the study instruments were found appropriate.

### **Ethical Considerations**

- The study was conducted after obtaining ethical clearance from ethics committee, Apollo Hospitals, Chennai.
- Permission was obtained from Director of Medical Education of Apollo Hospitals.
- Permission was obtained from Principal, Head of Department, Research and Medical guide.
- Consent was obtained from all the patients for participating in the study before the data collection.
- Confidentiality was maintained throughout the study.

### **Data Collection Procedure**

Data collection is the precise systematic gathering of information relevant to the research purpose. The investigator collected the data from Apollo Main Hospitals and Apollo speciality Hospitals Vanagaram after obtaining ethical clearance and proper administrative permission from concerned authorities. The observation time schedule was from 8am to 5pm the data collection period was from November to December.

A group of 30 subjects were selected from Apollo Main Hospitals, Greaves road in the experimental group and 30 were selected from Apollo speciality hospital Vanagaram. Purpose of the study and procedure was explained to the patients and written consent was obtained. Pre-test was conducted using the predetermined and pretested tools such as demographic variable proforma, clinical

variable proforma and upper extremity motor function assessment tool in control and experimental group of stroke patients. Post-test was conducted after three weeks of the intervention in the control group and the experimental group of stroke patients. Interview method was used to collect the data. After completion of the intervention, assessment of the experimental groups satisfaction regarding mirror therapy was ensured using rating scale.

### **Problems Faced During the Process of Data Collection**

Some patients' relatives were not interested to provide information.

### **Plan for Data Analysis**

Data analysis is the systematic organization, synthesis of research data and testing of null hypothesis by using obtained data (Polit and Beck, 2016)

The analysis and interpretation of the data was carried out by using descriptive and inferential statistics. Descriptive statistics like frequency, percentage, mean, standard deviation and inferential statistics like t-test and chi square test were used to analyze data.

### **Summary**

This chapter has dealt with selection of research approach, research setting, population, sample size, sampling techniques, sampling criteria, selection and development of study instruments, validity, reliability of the study, pilot study, data collection procedure, problems faced during data collection and plan for the data analysis.

## **CHAPTER IV**

### **ANALYSIS AND INTERPRETATION**

Data analysis is conducted to reduce, organize and give meaning to the data. The results obtained from data analyses require interpretation to be meaningful. Interpretation of data involves examination of the results from data analysis, formation of conclusions, consideration of the implications for nursing, exploration of the significance of the findings and suggestion of further studies (Polit and Beck, 2016).

This chapter deals with analysis and interpretation of data including both descriptive and inferential statistics. The data were analyzed according to the objectives and hypothesis of the study. Analysis of the data was compiled after all the data was transferred to the master coding sheet. The data were analyzed, tabulated and interpreted using appropriate descriptive and inferential statistics.

#### **Organization of Findings**

The findings of the study were organized and presented under the following headings.

- Frequency and Percentage Distribution of Demographic Variables in the Control Group and the Experimental Group of Stroke Patients.
- Frequency and Percentage Distribution of Clinical Variables in the Control Group and the Experimental Group of Stroke Patients.
- Frequency and Percentage Distribution Level of Motor Function of the Upper Extremity in the Control Group and the Experimental Group of Stroke Patients.

- Comparison of Mean and Standard Deviation of Motor Function before and after Mirror Therapy in the Control Group and the Experimental Group of Stroke Patients.
- Comparison of Mean and Standard Deviation of Motor Function before and after Mirror Therapy in the Control Group and the Experimental Group of Stroke Patients.
- Frequency and Percentage Distribution of Level of Satisfaction Scores Regarding Mirror Therapy among the Experimental Group of Stroke Patients.
- Association between the Demographic Variables and Motor Function before and after Mirror Therapy in the Control Group and the Experimental Group of Stroke Patients.
- Association between the Clinical Variables and Motor Function before and after Mirror Therapy in the Control Group and the Experimental Group of Stroke Patients.

**Table: 1**

**Frequency and Percentage Distribution of Demographic Variables in the Control Group and the Experimental Group of Stroke Patients.**

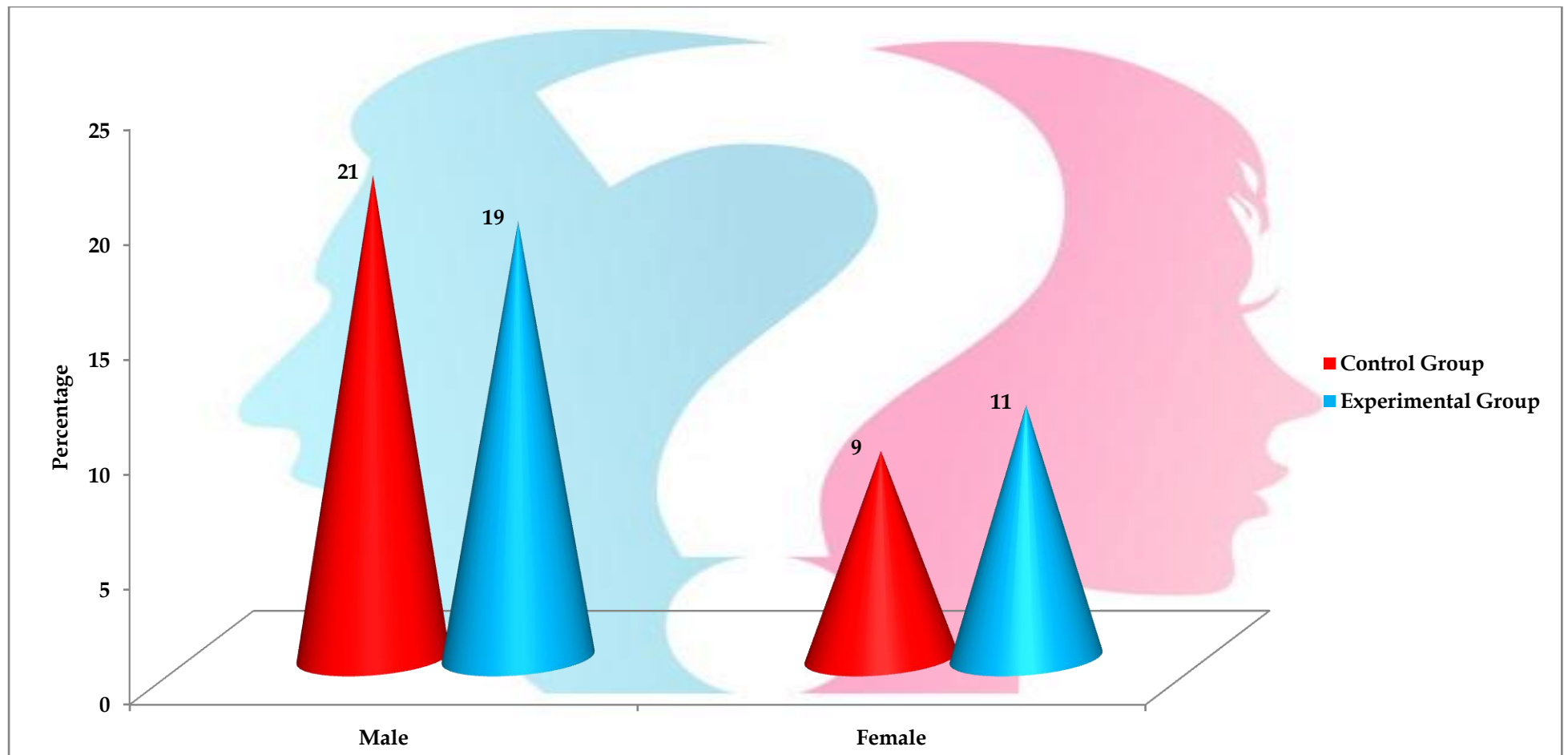
Demographic variables	Control group (n=30)		Experimental group (n=30)		$\chi^2$	p value
	f	%	f	%		
<b>Age in years</b>						
<35 years	3	10	3	10		
36-50years	11	36.66	11	36.66	-	-
51-65years	7	23.33	7	23.33		
>65years	9	30	9	30		
<b>Occupation</b>						
Student	2	6.66	2	6.66		
Unemployed	0	0	1	3.33		
Employed	13	43.33	13	43.33	0.01	-
Home Maker	6	20	6	20		
Retired	9	30	9	30		
<b>Educational status</b>						
Illiterate	1	3.33	1	3.33		
Primary school	1	3.33	1	3.33		
High school	1	3.33	3	10	-	-
Higher secondary	10	33.33	8	26.66		
Graduate& above	7	23.33	17	56.66		

Note: Relevant categories were clubbed for the computation of chisquare analysis.

From the table inferred that 36.66 % of the patients were in the age group between 36-50 years and most of them were males (70%, 63.33%), 43.33% of them were employed in control group and in experimental group respectively.

Findings also reveal that there was no statistically significant difference between the control group and the experimental group with regard to background characteristics of the patients such as age, gender, occupation, educational status indicating the homogeneity of the groups.





**Fig :3 Percentage Distribution of Gender for Control Group and Experimental Group of Stroke Patients.**

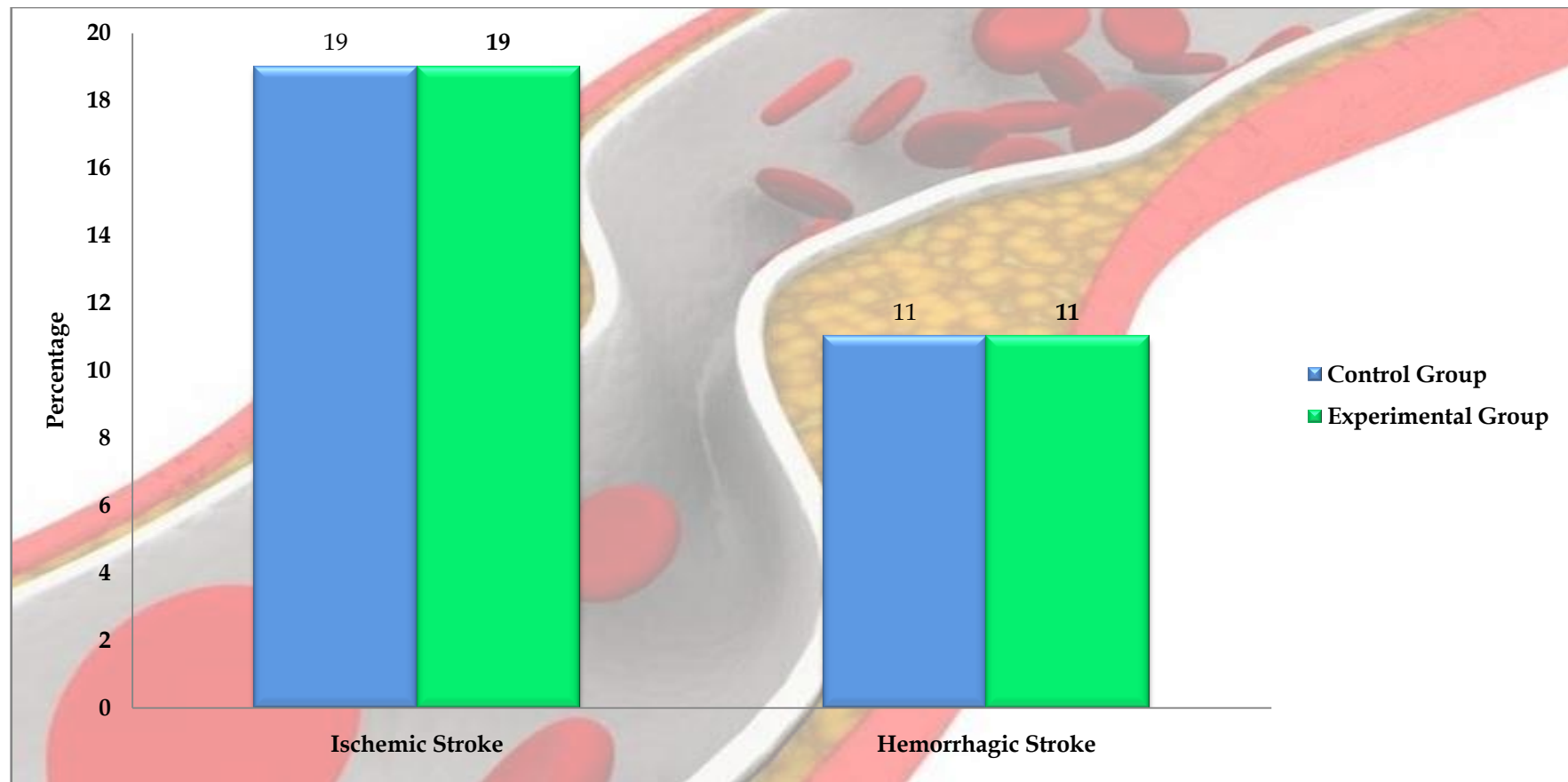
**Table.2**

**Frequency and Percentage Distribution of Clinical Variables in the Control and the Experimental Group of Stroke Patients.**

Clinical Variables	Control Group (n=30)		Experimental Group (n=30)	
	f	%	f	%
<b>Affected limb</b>				
Left upper limb	17	56.66	18	60
Right upper limb	13	43.33	12	40
<b>Co-morbidities</b>				
Absent	7	23.33	7	23.33
Hypertension	9	30	9	30
Coronary artery disease	6	20	8	26.66
Obesity	8	26.66	3	10
Any other	0	-	3	10
<b>Duration of illness</b>				
<1 month	8	26.66	9	30
1-4 months	10	33.33	8	26.66
5-8 months	5	16.66	8	26.66
9-12 months	7	23.33	5	16.66
<b>Habit of smoking</b>				
Yes	20	66.66	13	43.33
No	10	33.33	17	56.66
<b>Habit of alcoholism</b>				
Yes	9	30	13	43.33
No	21	70	17	56.66

Note: Relevant categories were clubbed for the computation of chi square analysis.

Table 2 revealed that most of the patients were diagnosed to have ischemic stroke (63%, 63.33%) with duration of illness 1-4 months (33.33%, 26.66%), smokers (66.66%, 43.33%) and 30%, 43.33% were alcoholics, 30 % , 30% had co-morbid illness in the control group and the experimental group respectively.



**Fig:4 Percentage Distribution of Types of Stroke in Control Group and Experimental Group.**

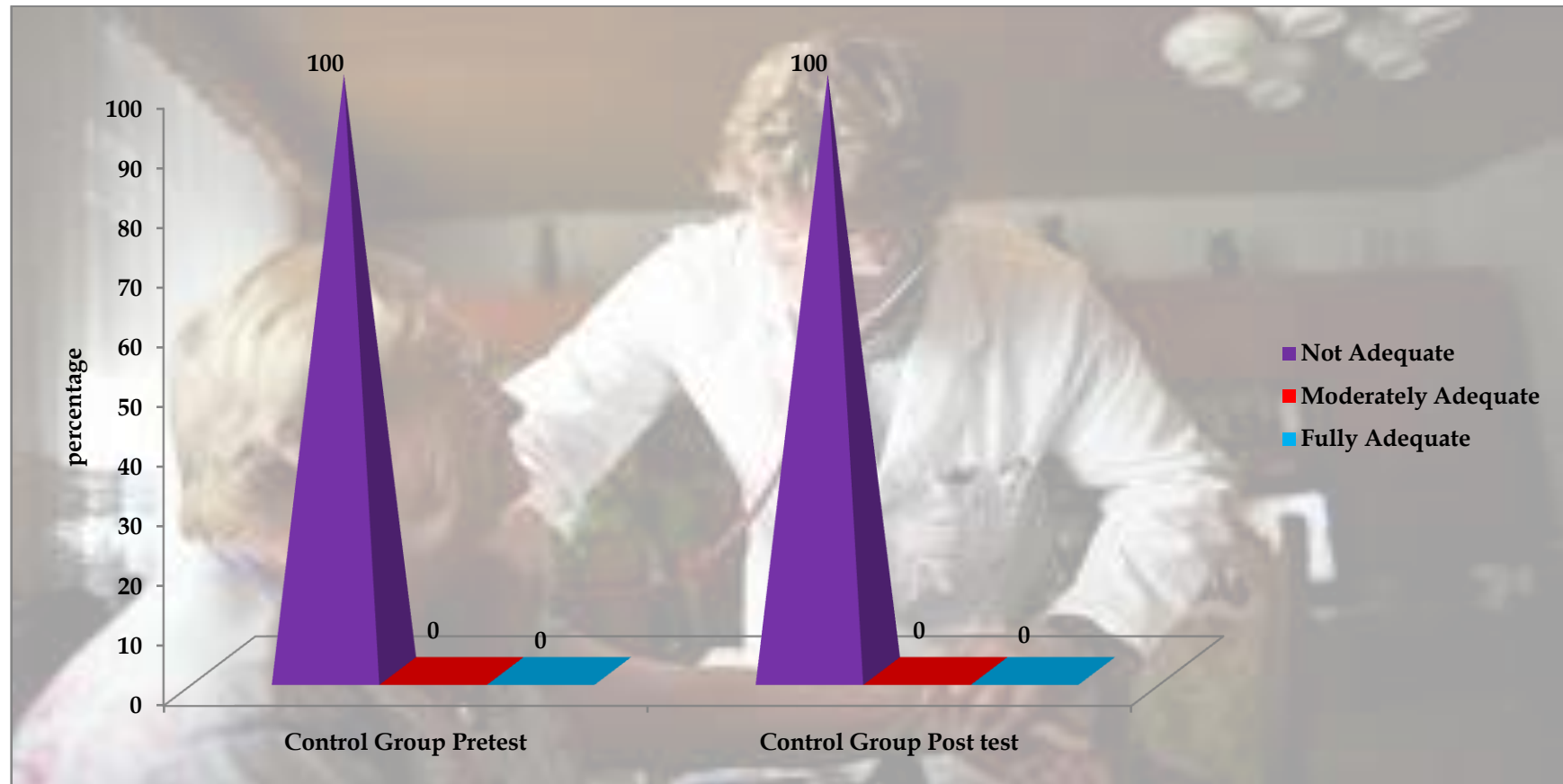
**Table.3**

**Frequency and Percentage Distribution of Level of Motor Function of the Upper Extremity in the Control and the Experimental Group of Stroke Patients.**

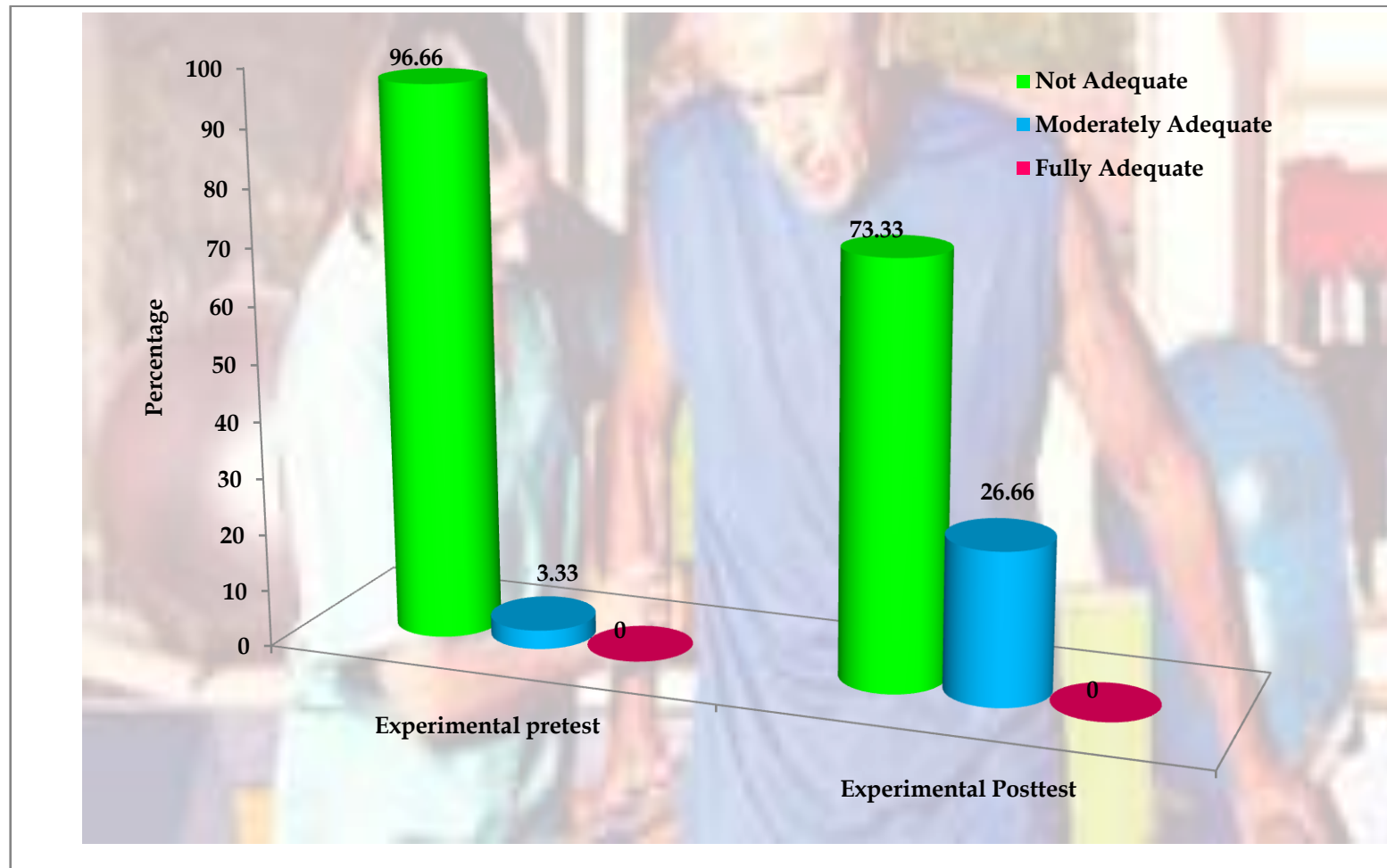
**(N=60)**

Level of Motor Function Upper Extremity	Control Group				Experimental Group			
	Pretest		Posttest		Pretest		Posttest	
	f	%	f	%	f	%	f	%
Not adequate (0-22)	30	100	30	100	29	96.66	22	73.33
Moderately adequate (23-44)	-	-	-	-	1	3.33	8	26.66
Adequate (45-66)	-	-	-	-	-	-	-	-

The data from the table 3 reveals that motor function of the upper extremity in the control group was not adequate (100%) in pretest and posttest whereas the motor function was moderately adequate in 26.66% of the patients during posttest in the experimental group.



**Fig:5 Percentage Distribution of Level of Motor Function of the Upper Extremity in the Control Group of Stroke Patients**



**Fig:6 Percentage Distribution of Level of Motor Function of the Upper Extremity in the Experimental Group of Stroke Patients**

**Table.4**

**Comparison of Mean and Standard Deviation of Motor Function of Upper Extremity in the Control and the Experimental Group of Stroke Patients.**

**(N=60)**

Group	Obtainable score	Control Group				Experimental Group			
		Mean	SD	MD	Paired t value	Mean	SD	MD	Paired t value
Pre test	0-66	16.03	3.36	0.77	0.79	16.26	4.99	3.54	<b>2.66**</b>
Post test		16.8	4.18			19.8	5.33		

**\*\*p<0.01**

Data presented in the table 4 reveals that, there was no significant difference between pretest (M=16.03, SD=3.36) and posttest (M=16.8, SD=4.18) in motor function of upper extremity among stroke patients in the control group, whereas there was statistically significant difference between pretest (M=16.26, SD=4.99) and posttest (M=19.8, SD=5.33) in motor function of upper extremity among stroke patients in the experimental group at p<0.01 level.



**Table: 5**

**Comparison of Mean and Standard Deviation of Motor Function of Upper Extremity between the Control Group and the Experimental Group of Stroke Patients.**

(N=60)

Group	Pretest			Posttest		
	Mean	SD	Independent t value	Mean	SD	Independent t value
Control group (n=30)	16.03	3.36	0.21	16.8	4.18	<b>2.43*</b>
Experimental group (n=30)	15.6	4.99		19.8	5.33	

**\*p<0.05**

Data presented in the table 5 reveals that, there was no statistically significant difference in the motor function of upper extremity pretest between the control group and the experimental group, whereas there was significant difference in posttest between the control group (M=16.8, SD=4.18) and the experimental group (M=17.93, SD=5.99). The posttest motor function was higher in the experimental group than in the control group (p<0.05). Hence the null hypothesis Ho1 stating that there will be no significant difference in the motor function of upper extremity before and after mirror therapy in the control group and the experimental group of stroke patients was rejected.

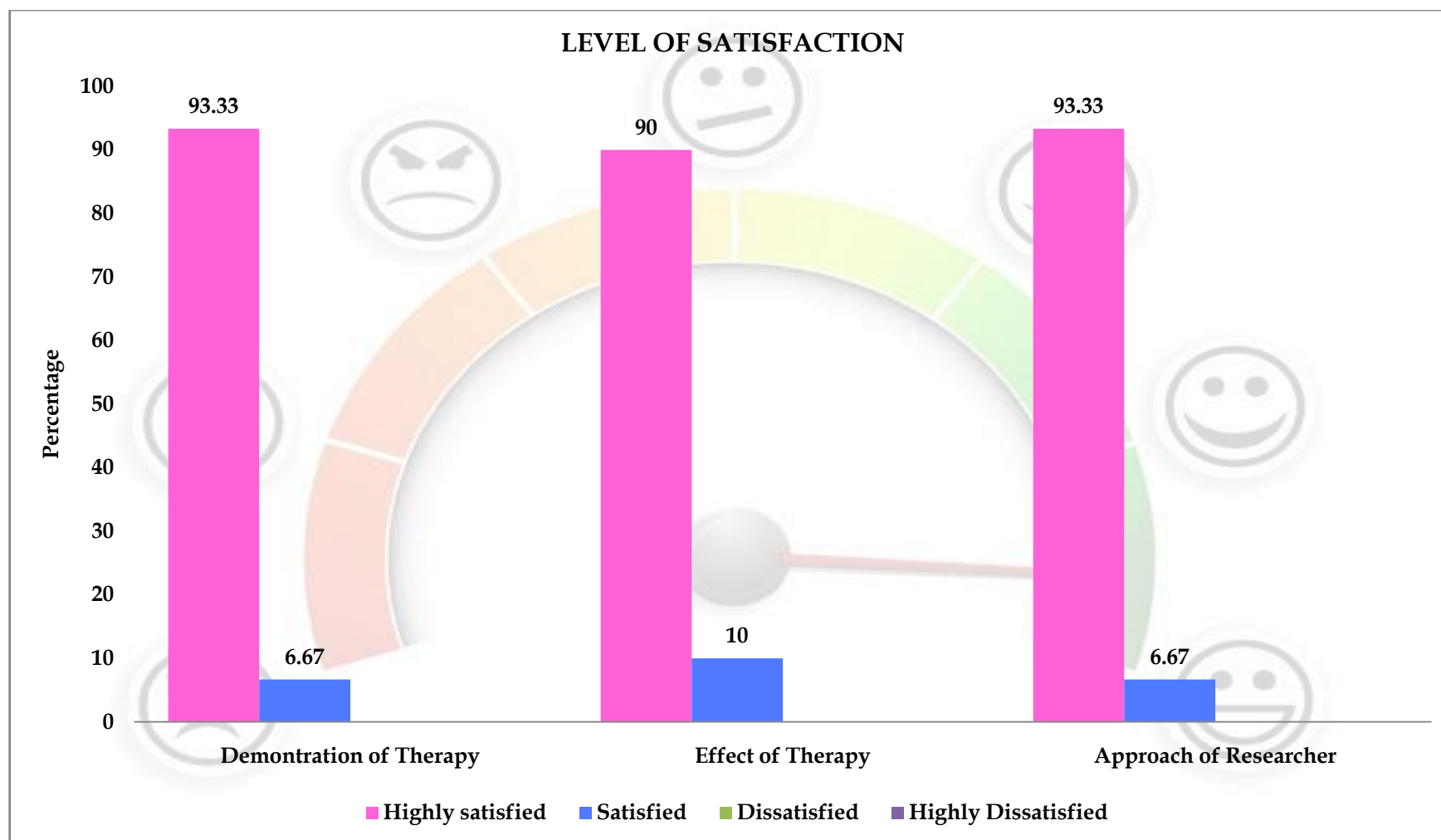
**Table. 6**

**Frequency and Percentage Distribution of Level of Satisfaction Scores Regarding Mirror Therapy in the Experimental Group of Stroke Patients.**

**(N=30)**

<b>Domain</b>	<b>Highly satisfied</b>		<b>Satisfied</b>		<b>Dissatisfied</b>		<b>Highly Dissatisfied</b>	
	<b>f</b>	<b>%</b>	<b>f</b>	<b>%</b>	<b>f</b>	<b>%</b>	<b>f</b>	<b>%</b>
<b>Demonstration of therapy</b>	28	93.33	2	6.67	-	-	-	-
<b>Effect of therapy</b>	27	90.00	3	10.00	-	-	-	-
<b>Approach of researcher</b>	28	93.33	2	6.67	-	-	-	-

It can be inferred from table 6 inferred that majority of the patients undergoing mirror therapy in experimental group were highly satisfied with the demonstration of mirror therapy (93.33%), the effectiveness of therapy (90%) and the approach of researcher (93.33%).



**Fig :7 Percentage Distribution of Level of Satisfaction Scores Regarding Mirror Therapy among the Experimental Group of Stroke Patients**

Table:7

Association between the Demographic Variables and Motor Function of Upper Extremity Before and After Mirror Therapy in the Control and the Experimental Group of Stroke Patients.

(N=60)

Demographic Variables	Control Group						Experimental Group					
	Pretest			Post test			Pretest			Post test		
	Upto Mean	Above Mean	$\chi^2$	Upto Mean	Above Mean	$\chi^2$	Upto Mean	Above Mean	$\chi^2$	Upto Mean	Above Mean	$\chi^2$
<b>Age in years</b>												
<50	4	10	3.54	5	9	2.14	9	5	2.14	8	6	1.15
>50	11	5	(df=1) #	10	6	(df=1)	6	0	(df=1) #	6	10	(df=1)
<b>Gender</b>												
Male	8	13	3.16	9	12	1.57	10	9	0.14	10	9	0.87
Female	7	2	(df=1) #	6	3	(df=1) #	5	6	(df=1)	4	7	(df=1) #
<b>Occupation</b>												
Employed	0	2	3.46	0	2	3.47	1	1	2.14	1	0	0.52
Unemployed	15	13	(df=1) #	15	13	(df=1) #	14	14	(df=1) #	13	15	(df=1) #

Note: # Yates Correction Value

Table 7 represented that, there was no significant association between the demographic variables namely age, gender, occupation and motor function of upper extremity. Hence the null hypothesis  $H_0$ 2 stating that there will be no significant association between the demographic variables and motor function of upper extremity before and after mirror therapy in the control group and the experimental group of stroke patients was retained.

Table:8

Association between the Clinical Variables and Motor Function of Upper Extremity before and after Mirror Therapy in the Control Group and the Experimental Group of Stroke Patients.(N=60)

Clinical Variables	Control group						Experimental group					
	Pretest			Post test			Pretest			Post test		
	Up to Mean	Above Mean	$\chi^2$	Up to Mean	Above Mean	$\chi^2$	Upto Mean	Above Mean	$\chi^2$	Upto Mean	Above Mean	$\chi^2$
<b>Types of stroke</b>												
Ischemic	8	11	1.22	9	10	0.14	11	8	0.56	10	9	0.87
Hemorrhagic	7	4	(df=1) #	6	5	(df=1) #	4	7	(df=1) #	4	7	(df=1) #
<b>Side affected</b>												
Right	9	8	0.13	9	8	0.13	9	8	0.13	9	8	0.62
Left	6	7	(df=1) #	6	7	(df=1) #	6	7	(df=1) #	5	8	(df=1) #
<b>History of co-morbidities</b>												
Absent	3	4	0.74	3	4	0.74	3	4	0.36	3	4	0.49
Present	12	11	(df=1) #	12	11	(df=1) #	12	11	(df=1) #	11	12	(df=1) #
<b>Duration of illness</b>												
Up to 6 months	6	12	3.66	7	11	2.00	7	10	1.22	7	10	0.47
Above 6 months	9	3	(df=1) #	8	4	(df=1) #	8	5	(df=1) #	7	6	(df=1) #
<b>Habit of smoking</b>												
Yes	4	5	0.63	4	5	0.63	6	7	0.13	5	8	0.62
No	11	10	(df=1) #	11	10	(df=1) #	9	8	(df=1) #	9	8	(df=1) #
<b>Habit of alcoholism</b>												
Yes	2	7	3.16	3	6	1.57	5	8	1.22	4	9	2.45
No	13	8	(df=1) #	12	9	(df=1) #	10	7	(df=1) #	10	7	(df=1) #

Note: # Yates Correction Value

Table 8 denotes that there was no significant association between the clinical variables and motor function. Hence the null hypothesis  $H_03$  stating that, there will be no significant association between the clinical variables and motor function of upper extremity before and after mirror therapy in the control and the experimental group of stroke patients was retained.

### **Summary**

This chapter has dealt with the analysis and interpretation of the data regarding the demographic variables, clinical variables and motor function of upper extremity before and after the administration of mirror therapy obtained by the researcher. The analysis showed that mirror therapy has a positive effect on motor function of upper extremity among stroke patients.

## **CHAPTER V**

### **DISCUSSION**

An Experimental Study to Assess the Effectiveness of Mirror Therapy Upon Motor Function of Upper Extremity among Stroke Patients at Selected Hospitals, Chennai.

#### **Objectives of the Study**

1. To assess the level of motor function of upper extremity before and after mirror therapy in the control group and the experimental group of stroke patients.
2. To determine the effectiveness of mirror therapy by comparing motor function of the upper extremity between the control group and the experimental group of stroke patients.
3. To assess the satisfaction regarding mirror therapy in the experimental group of stroke patients.
4. To find out the association between the demographic variables and motor function of upper extremity among the control group and the experimental group of stroke patients.
5. To find out the association between clinical variables and motor function of the upper extremity among the control group and the experimental group of stroke patients.

A quasi experimental research design was adopted for the study. The study was carried out on 60 stroke patients at Apollo Hospitals, Chennai. The effectiveness of the mirror therapy was assessed by using an observational checklist and rating scale after establishing validity and reliability. The main data collection was done after determining the feasibility and practicability through a



pilot study. The collected data was analyzed by using descriptive and inferential statistics.

**The discussion was presented under the following headings**

- Demographic variables of the control group and the experimental group upon motor function of upper extremity among stroke patients.
- Clinical variables of the control group and the experimental group upon motor functions of upper extremity among stroke patients.
- Level of motor function of the upper extremity in the control group and the experimental group of stroke patients.
- Effectiveness of mirror therapy by comparison of the motor function of upper extremity between the control group and the experimental group of stroke patients
- Level of satisfaction scores regarding mirror therapy among the experimental group of stroke patients.
- Association between the demographic variables and motor function of upper extremity before and after mirror therapy in the control group and the experimental group of stroke patients.
- Association between the clinical variables and motor function of upper extremity before and after mirror therapy in the control group and the experimental group of stroke patients.

### **Demographic Variables of the Control and the Experimental Group upon Motor Function of Upper Extremity of Stroke Patients.**

In the age group between 36-50 years there were 36.66% patients equally distributed, most of them were males (70%, 63.33%) and (43.33%, 43.33%), were employed in the control group and the experimental group respectively.

Findings also reveal that there is no statistically significant difference between the control group and the experimental group with regard to background characteristics of the patients indicating the homogeneity of the groups.

The results can be compared as per the World standard Population, Men are more prone to get stroke. Men, 495.91 per 1,00,000, women, 444.43 per 1,00,000 affected with stroke (Das, 2008).

### **Clinical Variables of the Control Group and the Experimental Group upon Motor Function of Upper Extremity of Stroke Patients.**

Most of the patients were diagnosed to have ischemic stroke (63%, 63.33%) with duration of illness 1-4 months (33.33%, 26.66%), smokers (66.66%, 43.33%) and 30%, 43.33% were alcoholics, 30 % had co morbid illness in the control and experimental group respectively.

Kurth (2003) conducted similar prospective study and found that increased risk of total hemorrhagic stroke, Intra cerebral hemorrhage, and subarachnoid hemorrhage in current cigarette smokers.

In this study most of the males were smokers, reflecting the fact that smoking is one of the risk factor of stroke.

**First Objective of the Study was to assess the Level of Motor Function of Upper Extremity before and after Mirror Therapy among the Control Group and the Experimental Group of Stroke Patients.**

Motor function of the upper extremity in the control group was not adequate (100%) during the pre and posttest, whereas the posttest of the experimental group motor function was moderately adequate (26.66%) of the patients.

In this study, there was significant difference in upper extremity motor function before and after mirror therapy in the control group and the experimental group.

Similar findings are also reported by Cywu (2013) to compare the effects of mirror therapy versus control treatment on movement performance, motor control and activities of daily living in people with stroke. It was randomized controlled trial, the application of mirror therapy after stroke result in beneficial effects on motor function of upper extremity in stroke survivors.

**Second Objective of the Study was to determine the Effectiveness of Mirror Therapy by Comparing the Motor Function of the Upper Extremity between the Control Group and Experimental Group of Stroke Patients.**

There was no significant difference between pretest ( $M=16.03$ ,  $SD=3.36$ ) and posttest ( $M=16.8$ ,  $SD=4.18$ ) in motor function of upper extremity among stroke patients in the control group, whereas there was statistically significant difference between pretest ( $M=16.26$ ,  $SD=4.99$ ) and posttest ( $M=19.8$ ,  $SD=5.33$ ) in motor function of upper extremity among stroke patients in the experimental group at  $p<0.01$  level.

In Independent 't' test, there was no statistically significant difference in motor functions of the upper extremity in the pretest between the control group and the experimental group, whereas there was significant difference in posttest between the control group ( $M=16.8$ ,  $SD=4.18$ ) and the experimental group ( $M=17.93$ ,  $SD=5.99$ ). The posttest motor function was higher in the experimental group than in the control group ( $p<0.05$ ). Hence the null hypothesis  $H_0$ 1 stating that there will be no significant difference in the motor function of upper extremity before and after mirror therapy in the control group and the experimental group of stroke patients was rejected.

Similar findings are also reported in this study conducted by Kamaleshkumar (2014) to investigate effectiveness of mirror therapy among stroke patients. After 3 weeks of mirror therapy, mean change scores were significantly greater in the mirror therapy group than in the control group.

Findings of the study are also similar to randomized control trial to evaluate the effects of mirror therapy on upper-extremity motor recovery, in patients with stroke. Study findings revealed that hand functioning improved significantly after mirror therapy (Yavuzer, 2008).

In this study, most of the stroke patients had upper extremity dysfunction after stroke. This shows that providing mirror therapy helps in improving motor function of upper extremity among stroke patients.

### **Third Objective was to assess the Level of Satisfaction Regarding Mirror Therapy in the Experimental Group of Stroke Patients.**

Majority of the stroke patients in the experimental group were highly satisfied with the method application of mirror therapy (93.33%), the effectiveness

of therapy (90%) and approach of researcher (93.33%). Hence it is very useful, inexpensive and simple and can be performed by all the patients with stroke.

**Fourth Objective of the Study was to find out the Association between the Demographic Variables and Motor Function of Upper Extremity before and After Mirror Therapy in the Control Group and the Experimental Group of Stroke Patients.**

There was no significant association between the demographic variables namely age, gender, occupation and motor function of upper extremity. Hence the null hypothesis  $H_02$  stating that there will be no significant association between the demographic variables and motor function of upper extremity before and after mirror therapy in the control group and the experimental group of stroke patients was retained.

**Fifth Objective was to find out the Association between the Clinical Variables and Motor Function of Upper Extremity, before and after Mirror Therapy in the Control Group and the Experimental Group of Stroke Patients.**

Study findings revealed that, there was no significant association between the clinical variables namely side affected with stroke, duration of illness, co-morbidities, history of smoking, history of alcohol and motor function. Hence the null hypothesis  $H_03$  stating that, there will be no significant association between the clinical variables and motor function of upper extremity before and after mirror therapy in the control group and the experimental group of stroke patients was retained.

## **Summary**

This chapter has dealt with the discussion of findings in the present study which includes demographic variables, clinical variables, and motor function of upper extremity among stroke patients, Effectiveness of mirror therapy on motor function of upper extremity, Association between the demographic variables and clinical variables on motor function of upper extremity, and the level of satisfaction of patients about the mirror therapy.

**CHAPTER VI**  
**SUMMARY, CONCLUSION, NURSING IMPLICATIONS**  
**RECOMMENDATIONS AND LIMITATIONS**

The heart of the research project lies in reporting the findings. This is the most creative and demanding part of the study. This chapter gives a brief account of the present study, suggestions for the future study and nursing implications.

**Summary**

The present study was intended to analyze and establish the Effectiveness of Mirror Therapy upon Motor Function of Upper Extremity among Stroke Patients at Selected Hospitals, Chennai.

**Objectives of the Study**

1. To assess the level of motor function of upper extremity in the control group and the experimental group of stroke patients.
2. To determine the effectiveness of mirror therapy by comparing motor function of upper extremity between the control group and the experimental group of stroke patients.
3. To assess the satisfaction regarding mirror therapy in the experimental group of stroke patients.
4. To find out the association between demographic variables and motor function of upper extremity among stroke patients.
5. To find out the association between clinical variables and motor function of the upper extremity among stroke patients.

### **Null Hypotheses**

- Ho1:** There will be no significant difference in the motor function of upper extremity between the control group and experimental group of stroke patients.
- Ho2:** There will be no significant association between demographic variables and motor function of upper extremity among the control group and the experimental group of stroke patients
- Ho3:** There will be no significant association between clinical variables and motor function of upper extremity among the control group and the experimental group of stroke patients.

The conceptual framework was developed on the basis of Myra Levine's energy conservation model, which was modified for the present study. An extensive review of literature and guidance from experts laid the foundation to the development of research tools.

In this study, a quasi-experimental design was adopted. Purposive sampling technique was used to select the patients for the control group and the experimental group. The present study was conducted among stroke patients at Apollo Main Hospital, Chennai and Apollo Specialty Hospital, Vanagaram, Chennai among stroke patients.

The sample size for the present study was 60 among which, 30 patients were randomly assigned to the control group and 30 patients to the experimental group who satisfied the inclusion criteria. The researcher used the demographic and clinical variable proforma of stroke patients to obtain the baseline data. The Fugl-Meyer motor assessment tool and rating scale for the level of satisfaction of



patients were the tools used to collect the data, after establishing validity and reliability. The main data collection was done after determining the feasibility and practicability through pilot study.

### **Major findings of the study**

#### **Demographic Variables of the Control Group and the Experimental Group upon Motor Function of Upper Extremity among Stroke Patients.**

In the age group between 36-50 years there were 36.66% patients equally distributed, most of them were males (70%, 63.33%), and (43.33%, 43.33%), were employed in the control group and the experimental group respectively.

Findings also reveal that there was no statistically significant difference between control group and experimental group with regard to background characteristics of the patients indicating the homogeneity of the groups.

#### **Clinical Variables of the Control Group and the Experimental Group upon Motor Function of Upper Extremity among Stroke Patients.**

Most of the patients were diagnosed to have ischemic stroke (63%, 63.33%) with duration of illness 1-4 months (33.33%, 26.66%), smokers (66.66%, 43.33%) and (30%, 43.33%) were alcoholics, (30%, 30%) had comorbid illness in the control group and the experimental group respectively.

#### **Level of Upper Extremity Motor Function before and after Mirror Therapy among the Control Group and the Experimental Group of Stroke Patients.**

The motor function of the upper extremity in the control group was not adequate (100%) during the pretest and remained the same (100%) during the

posttest also, whereas in the experimental group the motor function was moderately adequate (26.66%) of the patients during the posttest when compared to (3.33%) in the pre test.

### **Effectiveness of Mirror Therapy by Comparing Motor Function of Upper Extremity between the Control Group and the Experimental Group of Stroke Patients.**

There was no significant difference between pretest ( $M=16.03$ ,  $SD=3.36$ ) and posttest ( $M=16.8$ ,  $SD=4.18$ ) in motor function of upper extremity among stroke patients in the control group, whereas there was statistically significant difference between pretest ( $M=16.26$ ,  $SD=4.99$ ) and posttest ( $M=19.8$ ,  $SD=5.33$ ) in motor function of upper extremity among stroke patients in the experimental group at  $p<0.01$  level.

There was no significant difference in the motor function score of upper extremity pretest between the control group and the experimental group of stroke patients, whereas there was statistically significant difference in posttest between the control group ( $M=16.8$ ,  $SD=4.18$ ) and the experimental group ( $M=17.93$ ,  $SD=5.99$ ). The posttest motor function was higher in the experimental group than in the control group ( $p<0.05$ ) in independent 't' test. Hence the null hypothesis  $H_0$  stating that there will be no significant difference in the motor function of upper extremity before and after mirror therapy in the control and the experimental group of stroke patients was rejected.

### **Level of Satisfaction Regarding Mirror Therapy in the Experimental Group of Stroke Patients.**

Majority of the stroke patients in the experimental group were highly satisfied with the method application of mirror therapy (93.33%), the effectiveness of therapy (90%) and approach of researcher (93.33%). Hence it is very useful, inexpensive and simple and can be performed by all the patients with stroke.

### **Association between the Demographic Variables and Motor Function of Upper Extremity before and after Mirror Therapy in the Control and the Experimental Group of Stroke Patients.**

There was no significant association between the demographic variables and motor function of upper extremity among stroke patients. Hence the null hypothesis  $H_02$  stating that there will be no significant association between the demographic variables and motor function of upper extremity before and after mirror therapy in the control group and the experimental group of stroke patients was retained.

### **Association between the Clinical Variables and Motor Function of Upper Extremity before and after Mirror Therapy in the Control Group and the Experimental Group of Stroke Patients.**

Study findings revealed that, there was no significant association between the selected clinical variables and motor function of upper extremity among stroke patients. Hence the null hypothesis  $H_03$  stating that there will be no significant association between the clinical variables and motor function of upper extremity among stroke patients before and after mirror therapy in the control group and the experimental group of stroke patients was retained.

## **Conclusion**

The present study concludes with affirmation that the mirror therapy was effective in improving the motor function of upper extremity among stroke patients. A majority of the patients who received mirror therapy in the experimental group were highly satisfied with effectiveness of therapy and approach of researcher.

## **Implications**

The conclusion derived from the study can be implicated in the field of nursing practice, nursing education, nursing administration and nursing research.

### **Nursing Practice**

Mirror therapy was found better for improving the motor function of upper extremity among stroke patients. Hence it is the responsibility of the nurses to assess the level of the motor function of the upper extremity among stroke patients to enable encouragement to them in performing mirror therapy. In home care nursing nurses have to handle with the stroke patients to a larger degree.

This study will be useful for the home care nursing also since it is inexpensive but more effective. The nurse should have adequate knowledge regarding mirror therapy to enable incorporation of the derived conclusion in practice. Nurse as a team leader can plan, organize and co-ordinate activities for the patient contributing to the improvement of their health.

### **Nursing education**

With the emerging healthcare demands and newer trends in the field of Nursing education, the focus should be on the innovations to enhance nursing care. Nurses should have a good knowledge about stroke patient rehabilitation.

Integration of theory and practice is a vital need and is important in nursing education.

Nurse educators should take initiative to organize continuing nursing education programmes for nurses on the subject of the mirror therapy which could be instituted to the stroke patients. Demonstration of mirror therapy in the clinical set up helps students to acquire adequate knowledge and incorporate it in their practice. Nurse educators should take initiatives to publish articles in journals related to effectiveness of mirror therapy.

### **Nursing administration**

With technological advances and ever growing challenges to health care, the nurse administrators have a responsibility to provide nurses with substantive continuing nursing education opportunities. This will enable the nurses to update their knowledge, acquire special and demonstrate high quality care in improvement to health for the stroke patients by instituting mirror therapy and improve the motor function of upper extremity.

Nurse administrators should collaborate with governing bodies in formulating policies and protocols in providing patient education and plans for man, power, money, materials, methods and time to conduct successful and useful patient education programmes. Nurse administrators should provide opportunities for the nurses to attend various training programmes. Quality indicating audits should be conducted periodically.

### **Nursing research**

Because of the growing demand, there is a heightened urgency to expand,

The evidence base to support improving motor function of upper extremity among stroke patients. There is a need for extensive and intensive research in this area to generate a more specific data base and to identify the benefits of mirror therapy and to provide substantial information for practice.

It opens a big avenue for research on innovative methods to reduce fatigue and improve psychological wellbeing. Dissemination of the findings of the research through conferences, seminars, and publications in national and international nursing journals, World Wide Web will benefit a wider community. More theories can be generated on the basis of the research findings.

### **Recommendations**

- A similar study could be undertaken on larger scale for more valid generalization.
- The present study could be replicated in different settings.
- Similar study can be conducted to improve the motor function of lower extremity among stroke patients.
- A study could be conducted to assess the sensory function of stroke patients after mirror therapy.
- Study can be conducted to compare the effectiveness of mirror therapy with other interventions upon upper extremity motor function among stroke patients.
- A study could be conducted to assess the level of knowledge of nurses on mirror therapy.

### **Limitations**

- Study findings cannot be generalized due to small sample size.

## REFERENCES

- American Heart Association. (2013). *Heart disease and Stroke Statistics*. Retrieved from <http://www.strokesearch.org>.
- Bashir S, Caipa A, Plow EB.( 2017). Assessment of behavioral tasks performed by hemiplegic patients with impaired dexterity post stroke. *European Review for Medical and Pharmacological Sciences*, 21(10), 2443-2451.
- Buccino, G. (2006). Functions of the mirror neuron system: implications for neurorehabilitation. *Journal of Cognitive and Behavioral Neurology*, 19(1), 55-63
- Carvalho, D. (2013). The mirror neuron system in post-stroke rehabilitation. *International Journal of Archives of Medicine*, 6(41), 1755-7682.
- Colomer, C. (2016). Mirror therapy in chronic stroke survivors with severely impaired upper limb function: a randomized controlled trial. *European Journal of Physical Rehabilitation Medicine*, 52(3), 271-278
- Das, S. K., & Banerjee, T. K. (2008). *Journal of Stroke*. Circulation, 118(25), 2719-2724.
- Dohle, C. (2009). Mirror therapy promotes recovery from severe hemiparesis: a randomized controlled trial. *Journal of Neurorehabilitation and Neural Repair*, 23(3), 209-217.

- Ezendam, D. (2009). Systematic review of the effectiveness of mirror therapy in upper extremity function. *Journal of Disability and Rehabilitation*, 31(26), 2135-2149.
- Goldstein, L. B. (2006). Primary prevention of ischemic stroke: A guideline from the American heart association/American stroke association stroke council: *The American Academy of Neurology Affirms the Value of This Guideline*. *Stroke*, 37(6), 1583-1633.
- Gurbuz, N. (2016). Effect of mirror therapy on upper extremity motor function in stroke patients: a randomized controlled trial. *Journal of Physical Therapy Science*, 28(9), 2501–2506.
- Harmsen, W. J. (2015). A mirror therapy–based action observation protocol to improve motor learning after stroke. *Journal of Neuro Rehabilitation and Neural Repair*, 29(6), 509-516.
- Invernizzi, M. (2013). The value of adding mirror therapy for upper limb motor recovery of sub-acute stroke patients: a randomized controlled trial. *European Journal of Physical Rehabilitation Medicine*, 49(3), 311-317.
- Kim, H., & Shim, J. (2015). Investigation of the effects of mirror therapy on the upper extremity functions of stroke patients using the manual function test. *Journal of Physical Therapy Science*, 27(1), 227–229.
- Kim, K. (2016). Effects of mirror therapy combined with motor tasks on upper extremity function and activities daily living of stroke patients. *Journal of Physical Therapy Science*, 28(2), 483–487.



Kurth, T. (2003). Smoking and the risk of hemorrhagic stroke in men. *Journal of Stroke*, 34(5), 1151-1155.

Langhorne, P. (2009). Motor recovery after stroke: a systematic review. *The Lancet Neurology*, 8(8), 741-754.

Lee, M. (2012). The mirror therapy program enhances upper-limb motor recovery and motor function in acute stroke patients. *American Journal of Physical Medicine & Rehabilitation*, 91(8), 689-700.

Mahajan, B. K. (2010). *Methods in Biostatistics*. (7th ed.). St.Louis: Jaypee Brothers Medical publishers, 330-335.

Michielsen, M. E. (2010). Motor recovery and cortical reorganization after mirror therapy in chronic stroke patients: phase II randomized controlled trial. *Journal of Neurorehabilitation and Neural Repair*, 4(11), 1-11.

Mirela Cristina L. (2015) Mirror therapy enhances upper extremity motor recovery in stroke patients, *Journal of Physical Therapy Science*, 91(8), 689-700.

Mozaffarian, D. (2016). *Heart Disease and Stroke Statistics—2016 update*. Circulation, 133(4), e38-e360.

Nigar Gurbuz, (2016). Effect of mirror therapy on upper extremity motor function in stroke patients: a randomized controlled trial, *Journal of Physical Therapy Science*, 28(9): 2501–2506.

Park, J.-Y.(2015). The effect of mirror therapy on upper-extremity function and activities of daily living in stroke patients. *Journal of Physical Therapy Science*, 27(6), 1681–1683.

- Polit, F. et al. (2016) *Essentials of Nursing Research*. (5th ed.). Philadelphia. J.B. Publishers. 36.
- Pollock, A. (2014) Interventions for improving upper limb function after stroke. *Cochrane Database Systematic Review*. Nov 12(11) CD010820.
- Radajewska, A. (2013). The effects of mirror therapy on arm and hand function in sub-acute stroke in patients. *International Journal of Rehabilitation Research*, 36(3), 268-274.
- Rothgangel, A. S. (2011). The clinical aspects of mirror therapy in rehabilitation: A systematic review of the literature. *International Journal of Rehabilitation Research*, 34(1), 1-13.
- Samuel Kamalesh Kumar, S. (2014). Mirror therapy enhances motor performance in the paretic upper limb after stroke: A pilot randomized controlled trial. *Archives of Physical Medicine and Rehabilitation*, 95(11), 2000-2005.
- Stevens, J. A., & Stoykov, M. E. P. (2003). Using motor imagery in the rehabilitation of hemiparesis. *Archives of Physical Medicine and Rehabilitation*, 84(7), 1090-1092.
- Thieme, H. (2013). Mirror therapy for improving motor function after stroke. *Journal of Stroke*, 44(1), 1-2.
- Thieme, H. (2013). Mirror therapy for patients with severe arm paresis after stroke—a randomized controlled trial. *Journal of Clinical Rehabilitation*, 27(4), 314-324.

Wu, C. Y. (2013). Effects of mirror therapy on motor and sensory recovery in chronic stroke: A randomized controlled trial. *Archives of Physical Medicine and Rehabilitation*, 94(6), 1023-1030.

Yavuzer, G. (2008). Mirror therapy improves hand function in sub-acute stroke: A randomized controlled trial. *Archives of Physical Medicine and Rehabilitation*, 89(3), 393-398.

## APPENDIX I

### LETTER SEEKING PERMISSION TO CONDUCT THE STUDY



**Apollo College of Nursing**

(Recognised by the Indian Nursing Council and Affiliated to the Tamil Nadu Dr. M.G.R. Medical University, Chennai)

CO/0198/16

25.08.2016

To

Dr. Muralidharan.M  
Director of Medical Education  
Apollo Main Hospitals  
Greaves Road  
Chennai – 600006

Respected Sir,

**Sub:** To request permission for research study – Reg

**Greetings!** As part of the curriculum requirement our 2<sup>nd</sup> year M.Sc. (N) Student Ms.N.PRADEEPA has selected the following title for her research study.

**"A study to assess the effectiveness of mirror therapy upon motor function of upper extremity among poststroke patients at selected hospitals, Chennai"**

So I kindly request your good selves to permit her to conduct study in your Esteemed hospital.

Thanking you,

  
**DR.LATHA VENKATESAN**  
**PRINCIPAL**

  
**Dr. MURALIDHARAN. M**  
MB.,MRCS(EDIN),FRCS(GLAS).,  
FMAS(LAPROSCOPIC SURGERY)  
DIRECTOR MEDICAL EDUCATION  
SOUTHERN REGION  
APOLLO HOSPITALS, CHENNAI.

IS/ISO 9001:2000

Vanagaram to Ambattur Main Road, Ayanambakkam, Chennai - 600 095.  
Ph. : 044 - 2653 4387 Tele fax : 044 - 2653 4923 / 044- 2653 4386





## Apollo College of Nursing

(Recognised by the Indian Nursing Council and Affiliated to the Tamil Nadu Dr. M.G.R. Medical University, Chennai)

CO/0199/16

29.08.2016

TO

Dr.C.Paul Dilip Kumar  
Asst. Director Medical services  
Apollo Specialty Hospital  
Vanagaram  
Chennai – 600 095.

Respected Sir,

**Sub:** To request permission for research study – Reg


**Greetings!** As part of the the curriculum requirement our 2<sup>nd</sup> year M.Sc.  
(N) Student Ms.N.PRADEEPA has selected the following title for her  
research study.

**“A study to assess the effectiveness of mirror therapy upon motor  
function of upper extremity among poststroke patients at selected  
hospitals, Chennai”**

So I kindly request your good selves to permit her to conduct study in  
your Esteemed hospital.

Thanking you,

  
**DR.LATHA VENKATESAN**  
**PRINCPAL**

NS  
Kindly do me  
successful  
30/9/16  


IS/ISO 9001:2000

Vanagaram to Ambattur Main Road, Ayanambakkam, Chennai - 600 095.  
Ph. : 044 - 2653 4387 Tele fax : 044 - 2653 4923 / 044- 2653 4386

## APPENDIX II

### ETHICAL COMMITTEE CLEARANCE LETTER

#### Institutional Ethics Committee - Clinical Studies

Reg.No.: ECR/37/Inst/TN/2013



25 Nov 2016

To,  
Ms. N. Pradeepha,  
First year, M.Sc. (Nursing),  
Department of Medical Surgical Nursing,  
Apollo College of Nursing, Chennai.

**Ref:** An experimental study to assess the effectiveness of mirror therapy upon motor function of upper extremity among stroke patients in selected hospitals, Chennai.

**Sub:** Approval of the above referenced project and its related documents.

Dear Ms. Pradeepha,

The Institutional Ethics Committee-Clinical Studies has received the following document submitted by you related to the conduct of the above-referenced study -

- Project Proposal
- Consent form

The Institutional Ethics Committee-Clinical Studies reviewed and discussed the project proposal documents submitted by you at a meeting held on 22 November 2016.

The following Institutional Ethics Committee – Clinical Studies members were present at the meeting held on 22<sup>nd</sup> Nov 2016 at 3.30 PM at, Apollo Research & Innovations, Conference Hall, Room No: 19, 2nd Floor, Krishnadeep Chambers, (Apollo Hospitals, Annex No: 1), Wallace Garden, Chennai – 600006

S. No	Name	Gender	Designation	Affiliation	Position in the committee
1	Dr. Rema Menon	F	Blood Bank Transfusion Services	Apollo Hospitals, Chennai	Member Secretary
2	Dr. Pradeep Kumar	M	Pharmacologist	Apollo Hospitals, Chennai	Pharmacologist
3	Ms. Maimoona Badsha	F	Lawyer	Independent legal Practitioner, Chennai	Lawyer
4	Mrs. Malathy Chandrasekhar	F	Home based teacher	Freelance	Layperson
5	Dr. K. Sathyamurthi	M	Asst. Professor	Madras School of Social work, Chennai	Social Scientist

**Apollo Hospitals Enterprise Limited,**

21, Grems Lane, Off Grems Road, Chennai - 600 006, Tamil Nadu, India. Tel : +91-44-2829 5045 / 6641 Fax : +91-44-2829 4449

E-mail : [ecapollochennai@gmail.com](mailto:ecapollochennai@gmail.com)

## Institutional Ethics Committee - Clinical Studies

Reg.No.: ECR/37/Inst/TN/2013

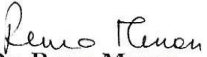


The Institutional Ethics Committee-Clinical Studies reviewed the proposal, its methodology and design of the study. The proposed thesis work is approved in the presented form without any modifications.

The Institutional Ethics Committee-Clinical Studies review and approval of the report is only to meet their academic requirement and will not amount to any approval of the conclusion / recommendations as conclusive, deserving adoption and implementations, in any form, in any health care institution.

The Institutional Ethics Committee-Clinical Studies is constituted and works as per ICH-GCP, ICMR and revised Schedule Y guidelines.

Regards,

  
**Dr. Rema Menon,**  
Member Secretary,  
Institutional Ethics Committee-Clinical Studies,  
Apollo Hospitals,  
Chennai.

Date: 25/11/2016

**MEMBER SECRETARY**  
**INSTITUTIONAL ETHICS COMMITTEE CLINICAL STUDIES**  
**APOLLO HOSPITALS, AHIL**  
**CHENNAI, TAMILNADU.**

---

**Apollo Hospitals Enterprise Limited,**

21, Grems Lane, Off Grems Road, Chennai - 600 006, Tamil Nadu, India. Tel : +91-44-2829 5045 / 6641 Fax : +91-44-2829 4449

E-mail : ecapollochennai@gmail.com

### **APPENDIX III**

#### **LETTER SEEKING PERMISSION FOR CONTENT VALIDITY**

From

Ms.N.Pradeepha  
M.Sc (Nursing) Second Year,  
Apollo College of Nursing,  
Chennai – 600 095.

To

Forwarded Through  
Dr.LathaVenkatesan,  
Principal,  
Apollo College of Nursing.

**Sub: Requesting for opinions and suggestions of experts for establishing content validity for research tool.**

Respected Madam,

I am a postgraduate student of the Apollo College of Nursing. I have selected the below mentioned topic for research project to be submitted to The Tamil Nadu Dr. M.G.R Medical University, Chennai as a partial fulfillment of Masters of Nursing Degree.

#### **TITLE OF THE TOPIC:**

**An experimental study to assess the effectiveness of mirror therapy upon motor function of upper extremity among stroke patients at selected hospitals, Chennai.**

With regards may I request you to kindly validate my tool for its appropriateness and relevancy. I am enclosing the Background, Need for the study, Statement of the problem, Objectives of the study, Demographic Variable Proforma, Clinical Variable Proforma, Observational checklist for stroke patients. I would be highly obliged and remain thankful for your great help if you could validate and send it as soon as possible.

**Thanking you,**

**Date: Yours sincerely,**

**(N. Pradeepha)**

**Place:**



## APPENDIX IV

### LIST OF EXPERTS FOR CONTENT VALIDITY

**1. Dr. Latha Venkatesan,**

M.Sc (N)., M.Phil (N)., Ph.D. (N)., Ph.D. (HDFS)., M.B.A (HM).,  
Principal and Professor in Maternity Nursing  
Apollo College of Nursing,  
Chennai – 95

**2. Dr . Sivarajan Thandeshwaran,**

M.B.B.S., MRCP(UK)  
Consultant Physician,  
Stroke and Neurovascular Medicine  
Apollo Main Hospitals,  
Greens Road ,Chennai-600 006.

**3. Dr.Lizy Sonia. A. M.Sc (N)., PhD (N).,**

Vice Principal  
H.O.D of in Medical Surgical Nursing,  
Apollo College of Nursing,  
Chennai – 95.

**4. Dr.Vijayalakshmi. K. M.Sc (N)., PhD (N).,**

Research co-ordinator  
H.O.D of Mental Health Nursing,  
Apollo College of Nursing,  
Chennai – 95.

**5. Mrs.Jaslina Gnanarani.J. M.Sc (N)., Ph.D (N).,**

Reader,  
Medical Surgical Nursing,  
Apollo College of Nursing,  
Chennai – 95.

**6. Mrs.Sasikala.D. M.Sc (N)., Ph.D (N).,**

Reader,

Medical Surgical Nursing,

Apollo College of Nursing,

Chennai – 95.

**7. Mrs. G Kanchana. M.Sc (N)., M.Sc (Psy).,**

Reader,

Medical Surgical Nursing,

Apollo College of Nursing,

Chennai – 95.

**APPENDIX V**  
**CERTIFICATE FOR CONTENT VALIDITY**  
**TO WHOMSOEVER IT MAY CONCERN**

I hereby certify that I have validated the research tool of Ms. N. Pradeepha M.Sc. (Nursing) student who is undertaking research study on **An experimental study to assess the effectiveness of mirror therapy upon motor function of upper extremity among stroke patients at selected hospitals, Chennai.**

**Signature of Expert**

**Name and Designation**

**APPENDIX VI**  
**RESEARCH PARTICIPANT CONSENT FORM**

Dear participant,

I am Pradeepha, M.Sc (N) student of Apollo College Of Nursing, Chennai. As part of my study, a research on **“An Experimental Study to Assess the Effectiveness of Mirror Therapy upon Motor Function of Upper Extremity Among Stroke Patients at Selected Hospitals, Chennai”** is selected to be conducted. The findings of the study will be helpful for the patients with difficulties in movements of upper extremity followed by stroke.

I hereby seek your consent and co-operation to participate in the study. Please be frank & honest in your responses. The information collected will be kept confidential and anonymity will be obtained.

I ----- hereby consent to participate in this study.

Signature of the Investigator

Place:

Date :

Signature of the participant

## APPENDIX VII

### LETTER SEEKING PERMISSION TO USE THE STUDY TOOL



---

Subject: Permission to use tool  
From: Pradeepha (pradeepha1491@yahoo.com)  
To: Fugl-Meyer@bcu.ac.uk;  
Date: Sunday, 30 February 2017 9:20 PM

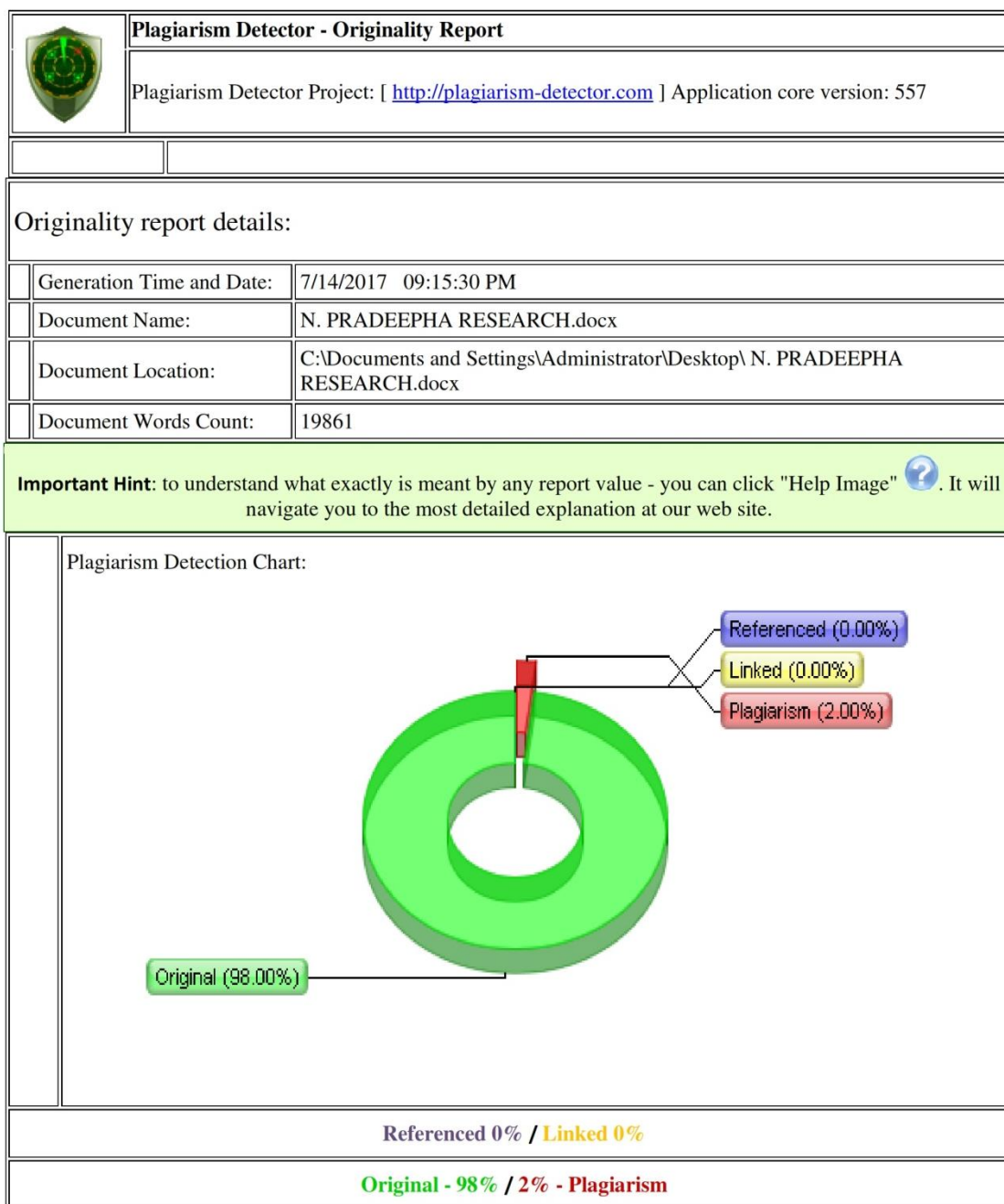
Dear Mr. Fugl Meyer AR,

With due respect I Ms. Pradeepha. N Msc Nursing II year would like to state that as a part of my curriculum requirement I am planning to do a research entitled "An experimental study to assess the effectiveness of mirror therapy upon motor function of upper extremity among stroke patients at selected hospitals Chennai" For the same I would like to use motor function sensorimotor tool as one of my tool. (for academic purpose only). Please consider my request and grant me permission for the same.

Thanking you

## APPENDIX VIII

### PLAGIARISM ORIGINALITY REPORT

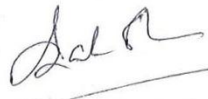


**APPENDIX IX**  
**CERTIFICATE FOR ENGLISH EDITING**

TO WHOMSOEVER IT MAY CONCERN

This is to certify that the dissertation “An experimental study to assess the effectiveness of mirror therapy upon motor function of upper extremity among stroke patients at selected hospitals, “Chennai” by Ms. N.Pradeepha M.Sc. (Nursing) student Apollo College of Nursing was edited for English language appropriateness.

**Prof. J.L. NARASIMHAN**  
New No.8, Second Main Road,  
Block B - F1, Krishna Nagar,  
Chromepet, Chennai-600 044.  
Cell : 94446 54720  
e-mail : profjln@yahoo.com

  
Signature of Expert

## APPENDIX X

### DEMOGRAPHIC VARIABLE PROFORMA OF STROKE PATIENTS

#### Purpose

This proforma is used to measure the demographic variables of patient such as age, sex, occupation, educational status.

#### Instructions

The researcher will collect the following information by interviewing the participants and by referring the hospital records. Please be frank and free in answering, It will be kept confidential and anonymity will be maintained.

#### Sample no:

##### 1.Age in years

- |                     |                          |
|---------------------|--------------------------|
| 1.1 $\leq 35$ years | <input type="checkbox"/> |
| 1.2 36-50 years     | <input type="checkbox"/> |
| 1.3 50-65 years     | <input type="checkbox"/> |
| 1.4 $> 65$ years    | <input type="checkbox"/> |

##### 2.Gender

- |            |                          |
|------------|--------------------------|
| 2.1 Male   | <input type="checkbox"/> |
| 2.2 Female | <input type="checkbox"/> |

##### 3.Occupation

- |                |                          |
|----------------|--------------------------|
| 3.1 Student    | <input type="checkbox"/> |
| 3.2 Employed   | <input type="checkbox"/> |
| 3.3 Unemployed | <input type="checkbox"/> |
| 3.4 Home Maker | <input type="checkbox"/> |
| 3.5 Retired    | <input type="checkbox"/> |



#### **4. Educational status**

4.1 Illiterate	<input type="text"/>
4.2 Primary education	<input type="text"/>
4.3 Secondary education	<input type="text"/>
4.4 Higher secondary education	<input type="text"/>
4.5 Graduates and above	<input type="text"/>

## APPENDIX XI

### CLINICAL VARIABLE PROFORMA OF STROKE PATIENTS

#### Purpose

This proforma is used to assess the clinical variable such as types of stroke, side affected with stroke, history of comorbidities, duration of illness, habit of alcoholism and habit of smoking.

#### Instructions

The researcher collects the following information by interviewing the participants and by referring the hospital records. Please be frank in your response it will be kept confidential and anonymity will be maintained.

#### Sample no:

##### 1. Types of stroke

1.1 Ischemic stroke

☐

1.2 Hemorrhagic stroke

☐

##### 2. Side affected with stroke

2.1 Left upper limb

☐

2.2 Right upper limb

☐

##### 3. History of comorbidities

3.1 Absent

☐

3.2 Hypertension

☐

3.3 Coronary artery disease

☐

3.4 Obesity

☐

3.5 Any other

☐

**4. Duration of illness**

5.1.  $\leq 1$  month

5.2. 2-6 months

5.3. 7-9 months

5.4. 10-12 months

**5. Habit of alcoholism**

6.1. Yes

6.2. No

**6. Habit of smoking**

7.1. Yes

7.2. No

## APPENDIX XII

### TOOL FOR ASSESSING MOTOR FUNCTION OF UPPER EXTREMITY ON MIRROR THERAPY IN STROKE PATIENTS

#### Purpose

The rating scale is designed to assess the motor function of upper extremity function of the participants.

#### Instructions

This information is filled by the researcher and collected information will be kept confidential and anonymity will be maintained. There are 66 items below. 2 points for the detail being performed completely, 1 point for the detail being performed partially and 0 for the detail not being performed.

A. UPPER EXTREMITY, sitting position				
I. Reflex activity		none	can be elicited	
Flexors: Biceps and finger flexors (at least one)		0	2	
Extensors: Triceps		0	2	
Subtotal I (max 4)				
II. Volitional movement within synergies, without gravitational help		none	partial	full
Flexor synergy: Hand from Contralateral knee to Ipsilateral ear. From extensor Synergy (shoulder adduction/ Internal rotation, Elbow Extension, Forearm pronation) to flexor synergy (shoulder abduction/ external rotation, elbow flexion, forearm supination). Extensor synergy: Hand from ipsilateral ear to the contralateral knee	Shoulder retraction	0	1	2
	Elevation abduction	0	1	2
	(90°) external rotation	0	1	2
	Elbow flexion	0	1	2
	Forearm	0	1	2
	Supination	0	1	2
	Shoulder adduction/internal rotation	0	1	2
	Elbow extension	0	1	2
	Forearm pronation	0	1	2
	Subtotal II (max 18)			
III. Volitional movement mixing synergies, without compensation		none	partial	full

<b>Hand to lumbar spine</b> hand on lap	Cannot perform or hand in front of Ant-sup iliac spine hand behind Ant-sup iliac spine (without Compensation) hand to lumbar Spine (without compensation)	0	1	2
<b>Shoulder flexion 0°- 90°</b> elbow at 0° pronation-supination 0°	Immediate abduction or elbow flexion Abduction or elbow flexion during movement flexion 90°, No shoulder abduction or elbow flexion	0	1	2
<b>Pronation-supination</b> elbow at 90° shoulder at 0°	Pronation/Supination, Starting Position impossible Limited pronation/Supination, Maintains starting position full pronation/Supination, maintains starting position	0	1	2
Subtotal III (max 6)				
<b>IV. Volitional movement with little or no synergy</b>		<b>none</b>	<b>partial</b>	<b>full</b>
<b>Shoulder abduction 0 - 90°</b> elbow at 0° forearm pronated	Immediate supination or elbow flexion supination or elbow flexion during movement abduction 90°, maintains extension and pronation	0	1	2
<b>Shoulder flexion 90° - 180°</b> elbow at 0° pronation-supination 0°	Immediate abduction or elbow flexion abduction or elbow flexion during movement flexion 180°, no shoulder abduction or elbow flexion	0	1	2
<b>Pronation/supination</b> elbow at 0° shoulder at 30°- 90° flexion	No pronation/supination, starting position impossible limited pronation/supination, maintains start position full pronation/supination, maintains starting position	0	1	2
Subtotal IV (max 6)				
<b>V. Normal reflex activity</b> assessed only if full score of 6 points is achieved in part IV; compare with the unaffected side		<b>Hyper</b>	<b>Lively</b>	<b>Normal</b>
Biceps, Triceps, Fingerflexors	2 of 3 reflexes markedly hyperactive or 0 points in part IV 1 reflex markedly hyperactive or at least 2 reflexes lively maximum of 1 reflex lively, none hyperactive	0	1	2
Subtotal V (max 2)				

Total A (max 36)				
<b>B. WRIST</b> support may be provided at the elbow to take or hold the starting position, no support at wrist, check the passive range of motion prior testing		<b>none</b>	<b>partial</b>	<b>full</b>
<b>Stability at 15° dorsiflexion</b> elbow at 90°, forearm pronated shoulder at 0°	Less than 15° active dorsiflexion 15°, no resistance tolerated maintains dorsiflexion against resistance	0	1	2
<b>Repeated dorsiflexion / volar flexion</b> elbow at 90°, forearm pronated shoulder at 0°, slight finger flexion	Cannot perform volitionally limited active range of motion full active range of motion, smoothly	0	1	2
<b>Stability at 15° dorsiflexion</b> elbow at 0°, forearm pronated slight shoulder flexion/abduction	Less than 15° active dorsiflexion 15°, no resistance tolerated maintains dorsiflexion against resistance	0	1	2
<b>Repeated dorsiflexion / volar flexion</b> elbow at 0°, forearm pronated slight shoulder flexion/abduction	Cannot perform volitionally limited active range of motion full active range of motion, smoothly	0	1	2
<b>Circumduction</b> elbow at 90°, forearm pronated shoulder at 0°	Cannot perform volitionally jerky movement or incomplete complete and smooth	0	1	2
Total B (max 10)				
<b>C. HAND</b> support may be provided at the elbow to keep 90° flexion, no support at the wrist, compare with unaffected hand, the objects are interposed, active grasp		<b>none</b>	<b>partial</b>	<b>full</b>
<b>Mass flexion</b> From full active or passive extension		0	1	2
<b>Mass extension</b> From full active or passive flexion		0	1	2
<b>GRASP</b>				
<b>a. Hook grasp</b> flexion in PIP and DIP (digits II-V), extension in MCP II-V	cannot be performed can hold position but weak maintains position against resistance	0	1	2
<b>b. Thumb adduction</b> 1-st CMC, MCP, IP at 0°, scrap of paper between thumb and 2-nd MCP joint	cannot be performed can hold paper but not against tug can hold paper against a tug	0	1	2

<b>c. Pincer grasp, opposition</b> pulpa of the thumb against the pulpa of 2-nd finger, pencil, tug upward	cannot be performed can hold pencil but not against tug can hold pencil against a tug	0	1	2
<b>d. Cylinder grasp</b> cylinder shaped object (small can) tug upward, opposition of thumb and fingers	cannot be performed can hold cylinder but not against tug can hold cylinder against a tug	0	1	2
<b>e. Spherical grasp</b> fingers in abduction/flexion, thumb opposed, tennis ball, tug away	cannot be performed can hold ball but not against tug can hold ball against a tug	0	1	2
<b>Total C (max 14)</b>				
<b>D. COORDINATION/SPEED</b> , sitting, after one trial with both arms, eyes closed, tip of the index finger from knee to nose, 5 times as fast as possible		<b>mark ed</b>	<b>slight</b>	<b>none</b>
<b>Tremor</b>	at least 1 completed movement	0	1	2
<b>Dysmetria</b> at least 1 completed movement	pronounced or unsystematic slight and systematic no dysmetria	0	1	2
		<b>≥ 6s</b>	<b>2 - 5s</b>	<b>&lt; 2s</b>
<b>Time</b> start and end with the hand on the knee	at least 6 seconds slower than unaffected side 2-5 seconds slower than unaffected side less than 2 seconds difference	0	1	2
<b>Total D (max 6)</b>				

A. UPPER EXTREMITY	/36
B. WRIST	/10
C. HAND	/14
D. COORDINATION / SPEED	/ 6
TOTAL A-D (motor function)	/66

**BLUEPRINT FOR RATING SCALE TO ASSESS THE LEVEL OF  
SATISFACTION OF PATIENTS REGARDING MIRROR THERAPY**

<b>S. No</b>	<b>Content</b>	<b>Items</b>	<b>Total</b>	<b>Percentage</b>
1	Demonstration of exercises	4, 5, 6, 7	4	40
2	Effect of exercises	8, 9,10	3	30
3	Approach of researcher	1, 2, 3	3	30
	Total		10	100%



## APPENDIX XIII

### TOOL FOR ASSESSING LEVEL OF SATISFACTION ON MIRROR THERAPY IN STROKE PATIENTS

#### Purpose

The rating scale is designed to assess the level of satisfaction of the participants. This is developed by the investigator to assess the satisfaction of the mirror therapy among patients with stroke. This is a 4 point scale ranging from 4-1 Highly Dissatisfied, Dissatisfied, Satisfied, Highly Satisfied.

#### Instructions

There are 10 items below. Kindly read the items. Response extends from highly satisfied, satisfied, dissatisfied and highly dissatisfied. Put a tick mark against your answers. Describe your responses freely and frankly. The responses will be kept confidential and used for research purpose only.

S. No	Items	Highly Satisfied	Satisfied	Dissatisfied	Highly Dissatisfied
1.	Explanation regarding mirror therapy.				
2.	Approach of the researcher.				
3.	Time spent by the researcher.				
4.	Duration of the intervention.				
5.	Arrangements made during the interventions.				
6.	The intervention was easy to understand.				
7.	Frequency of practicing mirror therapy.				

8.	Involvement of the participants.				
9.	Given at the appropriate time.				
10.	Usefulness of mirror therapy.				

**Scoring:**

Highly dissatisfied - 1

Dissatisfied - 2

Satisfied - 3

Highly satisfied - 4

**The total score is converted into percentage and graded below:**

Score Interpretation	Percentage
Highly satisfied	76 – 100 %
Satisfied	51 – 75 %
Dissatisfied	25 – 50 %
Highly Dissatisfied	Below 25 %

## APPENDIX XIV

### DATA CODE SHEET

#### **1. AGE: Age in years**

- 1.1 < 35 years
- 1.2 36-50 years
- 1.3 50-65 years
- 1.4 >65 years

#### **2. GEN: Gender**

- 2.1 Male
- 2.2 Female

#### **3. OCC: Occupation**

- 3.1 Student
- 3.2 Employed
- 3.3 Unemployed
- 3.4 Home Maker
- 3.5 Retired

#### **4. EDU: Educational status**

- 4.1 Illiterate
- 4.2 Primary education
- 4.3 Secondary education
- 4.4 Higher secondary education
- 4.5 Graduates and above

#### **1.TYP: Types of stroke**

- 1.1 Ischemic stroke
- 1.2 Hemorrhagic stroke

#### **2. SIDE: Side affected with stroke**

- 2.1 Left upper limb
- 2.2 Right upper limb

#### **3. HOC: History of co morbidities**

- 3.1 Absent
- 3.2 Hypertension
- 3.3 coronary artery disease
- 3.4 obesity
- 3.5 Any other

#### **4. DUR: Duration of illness**

- 5.1. ≤ 1 month
- 5.2. 1-6 months
- 5.3. 7-9 months
- 5.4. 10-12 months

#### **5. HOA: Habit of alcoholism**

- 6.1 Yes
- 6.2 No

#### **6. HOS: Habit of smoking**

- 7.1 Yes
- 7.2 No

**APPENDIX-XV**  
**MASTER CODING SHEET (CONTROL GROUP)**

SL NO	DEMOGRAPHIC VARIABLE				CLINICAL VARIABLE						FUGL MEYER MOTOR SCALE	
	AGE	GEN	OCC	EDU	TYP	SIDE	H/C	DUR	H/S	H/A	Pre-test	Post-test
1	1.2	2.1	3.3	4.4	1.1	2.1	3.2	5.1	6.2	7.2	15	16
2	1.4	2.2	3.4	4.1	1.2	2.2	3.4	5.3	6.2	7.2	18	19
3	1.1	2.1	3.1	4.5	1.1	2.1	3.1	5.4	6.1	7.1	15	15
4	1.2	2.1	3.3	4.4	1.1	2.2	3.5	5.2	6.1	7.1	13	14
5	1.3	2.1	3.3	4.5	1.1	2.1	3.3	5.1	6.2	7.2	15	15
6	1.2	2.2	3.3	4.5	1.2	2.2	3.2	5.2	6.2	7.2	19	20
7	1.3	2.1	3.5	4.4	1.1	2.2	3.1	5.2	6.2	7.2	14	15
8	1.2	2.1	3.3	4.4	1.1	2.1	3.3	5.1	6.2	7.1	9	20
9	1.4	2.2	3.5	4.4	1.2	2.1	3.2	5.4	6.2	7.2	20	20
10	1.2	2.1	3.4	4.2	1.1	2.2	3.2	5.3	6.1	7.1	14	14
11	1.4	2.1	3.5	4.5	1.1	2.1	3.1	5.4	6.2	7.2	21	21
12	1.2	2.2	3.3	4.5	1.2	2.1	3.3	5.1	6.2	7.2	20	20
13	1.4	2.2	3.5	4.5	1.1	2.2	3.2	5.4	6.2	7.2	19	19
14	1.3	2.2	3.5	4.4	1.1	2.2	3.4	5.2	6.2	7.2	18	18
15	1.2	2.1	3.4	4.3	1.2	2.1	3.1	5.4	6.2	7.2	12	12
16	1.4	2.2	3.5	4.5	1.2	2.1	3.3	5.1	6.2	7.2	12	13
17	1.3	2.1	3.4	4.3	1.1	2.2	3.2	5.2	6.2	7.2	14	15
18	1.2	2.1	3.3	4.5	1.1	2.2	3.3	5.3	6.1	7.2	18	19
19	1.3	2.1	3.3	4.5	1.2	2.1	3.4	5.2	6.1	7.1	20	22
20	1.4	2.2	3.4	4.4	1.2	2.1	3.2	5.4	6.2	7.2	18	9
21	1.4	2.1	3.5	4.5	1.1	2.2	3.4	5.2	6.2	7.2	19	20
22	1.3	2.1	3.3	4.5	1.1	2.1	3.1	5.4	6.2	7.2	18	19
23	1.2	2.1	3.3	4.5	1.1	2.1	3.3	5.1	6.2	7.1	12	13
24	1.1	2.2	3.1	4.5	1.2	2.2	3.2	5.2	6.2	7.2	15	16
25	1.1	2.1	3.3	4.4	1.1	2.1	3.3	5.3	6.1	7.2	17	18
26	1.2	2.1	3.4	4.3	1.1	2.1	3.4	5.2	6.1	7.1	14	15
27	1.3	2.1	3.3	4.5	1.2	2.2	3.5	5.1	6.1	7.2	14	15
28	1.2	2.1	3.3	4.5	1.1	2.2	3.1	5.2	6.2	7.1	9	11
29	1.4	2.1	3.5	4.5	1.2	2.1	3.2	5.1	6.1	7.2	18	19
30	1.4	2.1	3.5	4.5	1.1	2.1	3.1	5.3	6.2	7.1	21	22

### MASTER CODING SHEET (EXPERIMENTAL GROUP)

SL NO	DEMOGRAPHIC VARIABLE				CLINICAL VARIABLE						FUGL MEYER MOTOR SCALE	
	AGE	GEN	OCC	EDU	TYP	SIDE	H/C	DUR	H/S	H/A	Pre-test	Post-test
1	1.2	2.1	3.3	4.4	1.1	2.1	3.5	5.3	6.1	7.1	34	40
2	1.4	2.2	3.4	4.1	1.2	2.2	3.2	5.1	6.2	7.2	22	24
3	1.1	2.1	3.1	4.5	1.1	2.1	3.3	5.2	6.1	7.2	17	20
4	1.2	2.2	3.3	4.4	1.1	2.2	3.3	5.3	6.1	7.1	16	20
5	1.3	2.1	3.3	4.5	1.1	2.1	3.1	5.4	6.2	7.2	9	14
6	1.2	2.2	3.3	4.5	1.2	2.2	3.3	5.1	6.1	7.1	12	15
7	1.3	2.1	3.5	4.4	1.1	2.2	3.2	5.2	6.2	7.2	12	16
8	1.2	2.1	3.3	4.4	1.1	2.1	3.3	5.3	6.1	7.2	12	14
9	1.4	2.2	3.5	4.4	1.2	2.1	3.4	5.2	6.1	7.1	14	17
10	1.2	2.1	3.4	4.2	1.1	2.2	3.2	5.1	6.2	7.2	12	15
11	1.4	2.1	3.5	4.5	1.1	2.1	3.4	5.3	6.2	7.2	18	24
12	1.2	2.2	3.3	4.5	1.2	2.1	3.1	5.4	6.2	7.1	20	24
13	1.4	2.2	3.5	4.5	1.1	2.2	3.5	5.2	6.1	7.1	15	20
14	1.3	2.2	3.5	4.4	1.1	2.2	3.3	5.1	6.2	7.2	18	20
15	1.2	2.1	3.4	4.3	1.2	2.1	3.2	5.2	6.2	7.2	13	15
16	1.4	2.2	3.5	4.5	1.2	2.1	3.1	5.2	6.1	7.2	13	15
17	1.3	2.1	3.4	4.3	1.1	2.2	3.3	5.1	6.2	7.1	12	15
18	1.2	2.1	3.3	4.5	1.1	2.2	3.2	5.4	6.2	7.2	19	22
19	1.3	2.1	3.3	4.5	1.2	2.1	3.2	5.3	6.1	7.1	12	16
20	1.4	2.2	3.4	4.4	1.2	2.1	3.1	5.4	6.2	7.2	12	17
21	1.4	2.1	3.5	4.5	1.1	2.2	3.3	5.1	6.2	7.1	11	14
22	1.3	2.1	3.3	4.5	1.1	2.1	3.2	5.4	6.1	7.1	14	18
23	1.2	2.2	3.3	4.5	1.1	2.1	3.4	5.2	6.2	7.2	22	25
24	1.1	2.2	3.1	4.5	1.2	2.2	3.1	5.1	6.2	7.1	13	18
25	1.1	2.1	3.3	4.4	1.1	2.1	3.3	5.3	6.1	7.2	18	20
26	1.2	2.1	3.4	4.3	1.1	2.1	3.2	5.3	6.2	7.2	21	24
27	1.3	2.1	3.3	4.5	1.2	2.2	3.5	5.1	6.1	7.2	20	22
28	1.2	2.1	3.3	4.5	1.1	2.2	3.1	5.2	6.2	7.1	20	23
29	1.4	2.1	3.5	4.5	1.2	2.1	3.2	5.1	6.1	7.2	19	22
30	1.4	2.1	3.5	4.5	1.1	2.1	3.1	5.3	6.2	7.1	18	25

**APPENDIX XVI**  
**PHOTOGRAPH DURING MIRROR THERAPY**

